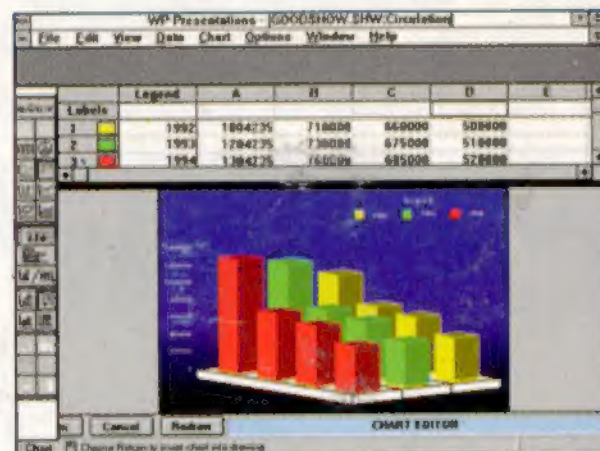


EDITORIAL
LIBRARY

Presentation Graphics:
10 Exciting Desktop
Presentation Packages
Plus 10 High-Res LCD
Projection Panels



**NETWORK
EDITION
MAGAZINE**

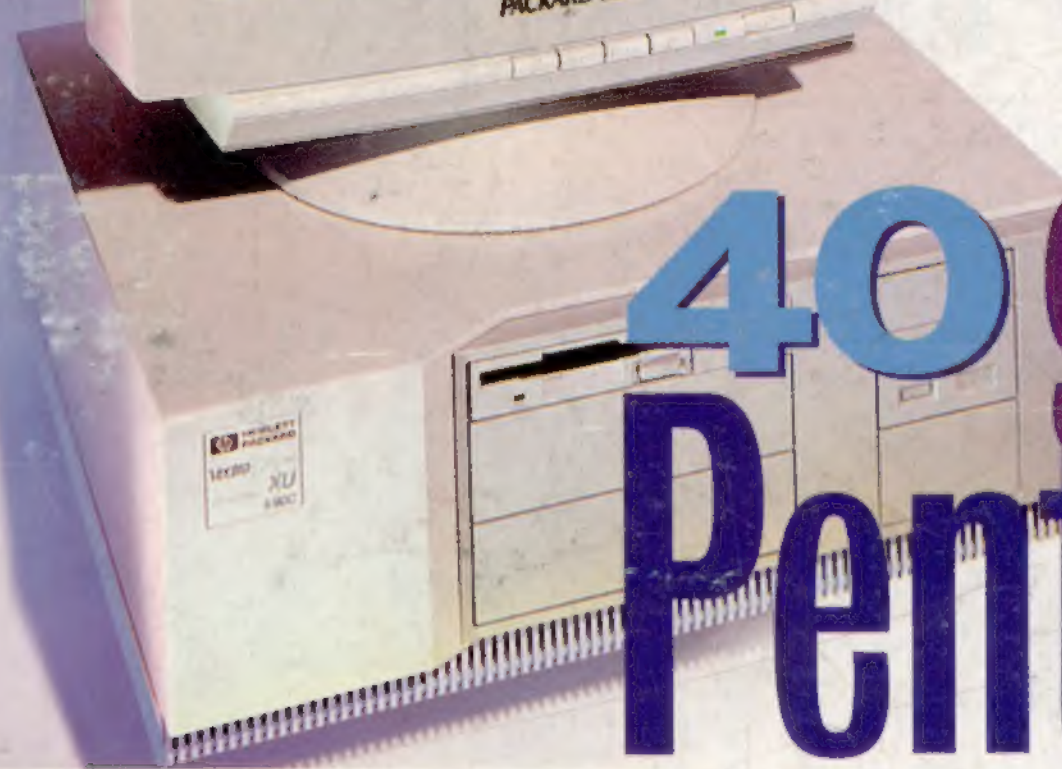
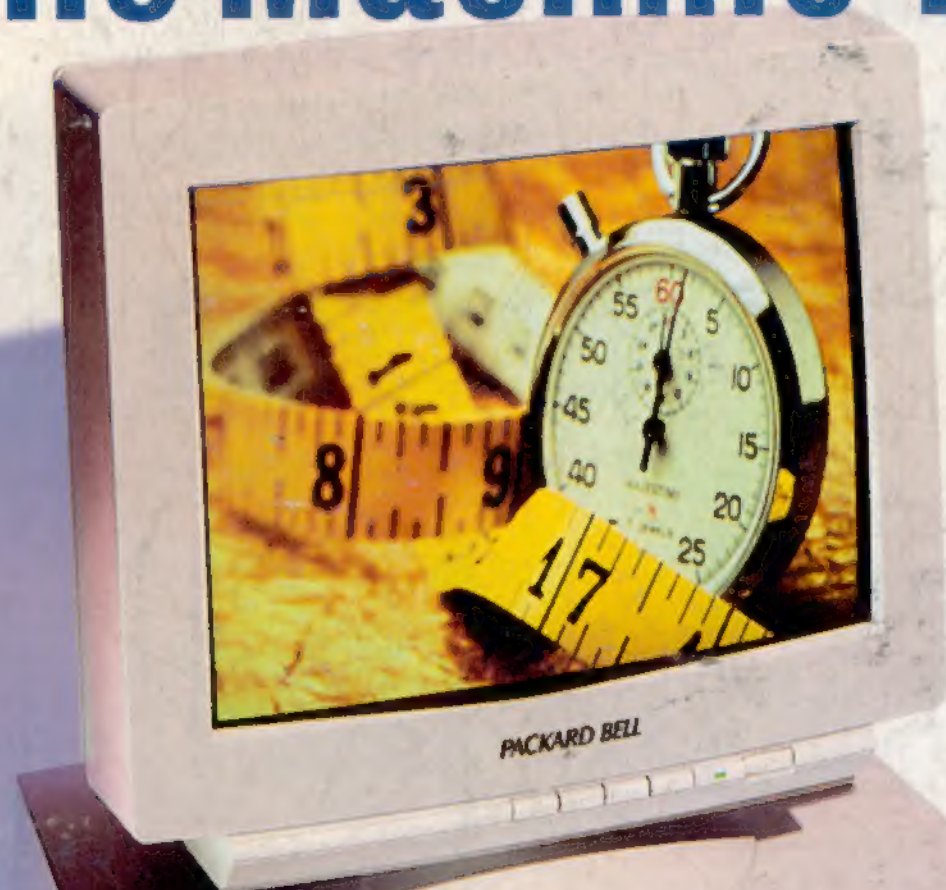
First Looks: Lotus
1-2-3, Release 5,
Takes On Excel

Network Edition:
Which Fax Server
Is Right for You?

The Machine You Really Want

PC LABS TESTS

**42 17-Inch
Monitors
&
40 90-MHz
Pentium PCs**



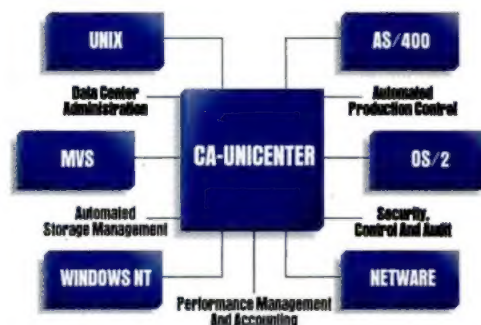
**THEY SHARE.
THEY COMPLEMENT
EACH OTHER.
THEY GIVE AND TAKE.**



Presenting The 7 Of Systems Mana



1 Replace Disparate
Point Products With A
Single, Integrated,
Comprehensive Solution.



2 Choose A Client/Server
Application That's
Interoperable, Scalable
and Portable.

3 Demand An Open
Solution That Supports
All Key Industry Standards
And Protocols.



**COMPUTER
ASSOCIATES**
Software superior by design.

Commandments gement Software.



4 Standardize On A Common GUI Interface That Makes It Easier To Use. Reduce Training Costs And Boost Productivity.



7 Protect All Your Data With Bulletproof Security Software That Supports Every Platform And Operating System Across Your Entire Enterprise.

5 Partner With The World's Leading Software Company.



6 Leverage Your Systems Management Experience, Expertise And Personnel.



When choosing your systems management software, you shouldn't have to make a leap of faith. And with new CA-Unicenter,* you don't have to. Because CA-Unicenter is the single, integrated systems management solution that solves all of the challenges of managing client/server computing across heterogeneous platforms.

So call today for more information about the systems management software you can believe in: CA-Unicenter.

**Call 1-800-225-5224 Dept. 10007 For More Information
And To Register For The CA-Unicenter Software Giveaway.**

CIRCLE 075 ON READER SERVICE CARD

CA-Unicenter®

Integrated Client/Server Systems Management Software

© Computer Associates International, Inc., Ispindia, NY 11788-7000. Offer good in U.S. and Canada only. All other product names referenced herein are trademarks of their respective companies. Requirements for Software Giveaway available through toll-free number.

MAKE WINDOWS & DESKTOP CONFERENCING EASIER

WITH ON-SCREEN INPUT

INTRODUCING

PenDirect[™]

for Windows[™]

WORK NATURALLY — PenDirect brings Windows to life with state-of-the-art light pen input. Interaction is fast, natural and one-to-one. No other input device is better for comfortable, strain-free Windows computing.

SAVE MONEY — PenDirect for Windows includes everything in one low-price bundle: a light pen (works with all Windows apps and external monitors), external interface, light pen driver for Windows and DOS, and FutureLabs' TalkShow point-to-point desktop conferencing software.

BUY WITH CONFIDENCE — PenDirect is backed by an unconditional, 30-day, no-risk, no-hassle, money-back guarantee, and a limited two-year warranty.

ONLY \$298
limited-time offer

Try PenDirect **FREE** for 30 days, and keep the TalkShow Duo software even if you return PenDirect!

ORDER NOW

800-962-3907

Corporate • Government • Educational
P.O.s Accepted
CIRCLE 200 ON READER SERVICE CARD

**FTC DATA
SYSTEMS**

The Leader
in Light Pen Technology

8381 Katella Avenue • Stanton, CA 90680
714-995-3900 • 714-995-3900 FAX
E-Mail: 70444.66@compuserve.com

Inside

We're talking breathtakingly fast here! How fast are the 40 second-generation 90-MHz Pentium machines we tested in this issue? Nearly 40 percent faster than their 60- and 66-MHz predecessors and more than twice as fast as a DX2/66-

based machine.

Not only are the new 90-MHz Pentiums fast, they're affordable too. While a \$3,000 price tag doesn't quite buy everything you'd expect from a top-of-the-line system, we found a number of machines for about \$3,500 that came packed with swell sets of

signed machines could actually turn in worse scores than 60-MHz Pentium systems. These findings make our story "Pentium Powerhouses" a must-read for those who drum their fingers on the table, fiddle with their mice, or mutter "Can't this thing go faster?"

Two recently promoted veteran *PC Magazine* staffers were behind the scenes transforming our test results for fast PCs into practical editorial. As we see it, John Clyman, our new associate editor in charge of PCs, had the words "*PC Magazine* Editor Material" emblazoned on his forehead from birth. He's the kind of guy who gets visibly excited when we delve into the details of super-scalar architecture—the kind of guy who carts home the Intel technical specs for bedtime reading. Clyman relishes the prospect of tackling the close to 500 PC reviews we do each year, and we relish having him to do it.

Rich Fisco braved graphics reviews as a technical analyst before he moved on to the PCs team as project leader. Fisco's job description calls for a mix of technical guru and juggler. At this moment, he's juggling the Pentium story, a server story, a processor upgrade story, and reviews of more than 150 PCs for our December 6 issue.—*Robin Raskin*



John Clyman and Rich Fisco traveling at 90 MHz.

components. And for less than \$5,000 you can buy a nice, big, juicy gigabyte hard disk and fast graphics subsystem to qualify your machine as a dream-machine candidate. Add one of the 42 17-inch monitors we also review in this issue and you can really configure a sweet system.

Building a fast Pentium box, we found out, is really an art as much as a science. For this class of machine, design is paramount. PC Labs' tests showed that poorly de-

PC Magazine: The Independent Guide to Personal Computing, ISSN 0888-8507, is published biweekly except in July and August for \$49.97 for one year. Ziff-Davis Publishing Company, L.P., One Park Ave., New York, NY 10016-5802. Second-class postage paid at New York, NY 10016-5802 and at additional mailing offices. POSTMASTER: Address changes to PC Magazine, P.O. Box 54093, Boulder, CO 80322-4093. GST Registration Number: R-123689673. Canada Post International Publications Mail Product (Canadian Distribution) Sales Agreement No. 266477.

Blast thru the FM sound barrier

with *SOUND Canvas*™

DB

Only \$229!



Upgrade your FM sound card* to wavetable sound with Roland's new Sound Canvas DB™ Articulated-Wave™ snap-on-card. Made possible by Roland's proprietary RS PCM technology and world-class sound library, this new card gives you sound far beyond even the most advanced wavetable sound cards! Includes \$99 software with DoReMiX™, Easy Juke™, and over 100 songs (3 hours & 45 minutes of copyright-free music in Standard MIDI File format). A \$328 value! Go find Sound Canvas DB at your local computer store or call 800-386-7575 and select 2 to receive an exciting, full-color brochure.

Roland®

CIRCLE 047 ON READER SERVICE CARD

Roland Corporation U.S.
7200 Dominion Circle
Los Angeles, CA 90040-3696
Phone (213) 685-5141
FAX (213) 722-0911

Roland Canada Music Ltd.
5480 Parkwood Way
Richmond, B.C., V6V 2M4
Phone (604) 270-6626
FAX (604) 270-6552

*Sound Blaster™ 16, Sound Galaxy Pro™ 16, and other FM sound cards with compatible connector.
© Roland Corporation U.S. 1994. All other trademarks are the property of their respective owners.

Fast start . . . No limits!

NEW VERSION **5.0**

Paradox



▲ Paradox for Windows has superior integration with Microsoft Office applications. You can place any "live" Paradox table directly into a Word document, and edit it in place.

New version is easier than ever

The new Paradox® 5.0 for Windows is here, and managing your business data and building database applications just got faster and easier. New Interactive Coaches quickly teach you how to accomplish any task, while working with your own "live" data. On-line Experts™ guide you step-by-step in creating professional-looking forms, reports, and mailing labels. Even your largest data management tasks will be completed with unbelievable speed and accuracy.

More speed, developer enhancements, and Client/Server connectivity

New Paradox 5.0 for Windows has been tuned to give you the highest possible performance. It stores and retrieves data faster. Delivers answers to queries faster. And for Paradox developers, there's

Comparison Facts

End-user Features	Paradox 5.0	Access 2.0
Built-in computer-based training	✓	
Integrated graphics	✓	
Built-in workgroup and mail capabilities	✓	
Quick Filter without Query Process	✓	
Power-user/Developer Features		
OLE 2.0 client and server support	✓	
Compatibility with applications from previous version	✓	
Transparent connectivity and scalability with database aliases	✓	
Record level locking	✓	
Graphical Integrated Development Environment (IDE)	✓	
ODBC-compliant	✓	✓
Dedicated high-performance native SQL drivers	✓	

a new Integrated Development Environment and more than 300 new ObjectPAL™ Methods and Properties that help you develop Windows applications in record time. Plus, with the new native SQL drivers, Paradox is ready when you are to upsize your applications to the Client/Server environment.

Office integration outshines Access

Full client and server support for OLE 2.0 and DDE make Paradox for Windows the best database for use with other applications including Perfect Office and Microsoft Office. For example, place a "live" Paradox table directly into a Word document, and edit it in place. (Can't do that with Access.)

Try new Paradox 5.0 for Windows today. You'll discover it's the one database with the depth and performance you want to stay with. And watch for the Paradox World Tour coming soon. Call Fast Fax for dates and locations.

Special competitive upgrade offer **\$199⁹⁵**

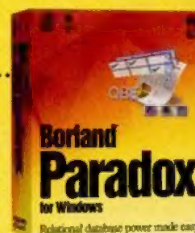
90-day money-back guarantee

See your dealer, or call today!

1-800-336-6464, ext. 9129

In Canada call 1-800-461-3327

Fast Fax 1-800-408-0001



Borland
The Upsizing Company

UP FRONT

Inside

90-MHz Pentiums to the test.....4

Letters

The changing face of office computing.....19

Trends

- Get ready for telephony
- Sending wireless faxes
- Machine translation
- Pipeline: Is shareware doomed?29

First Looks



- TEAC SuperQuad 4X AT CD-ROM Drive
- WordPerfect Envoy
- Lotus 1-2-3 for Windows, Release 5
- Aldus FreeHand 4.0 for Windows37

New & Improved

BY ADAM A. HICKS.....61

Read Only

EDITED BY TIN ALBANO73

COLUMNISTS

Michael J. Miller

The Politics of PC Science79

Bill Machrone

The Technology Rift87

John C. Dvorak

The Impending CD-ROM Fiasco93
Inside Track95

Jim Seymour

That Movable Feast:
The Sweet Spot99

Bill Howard

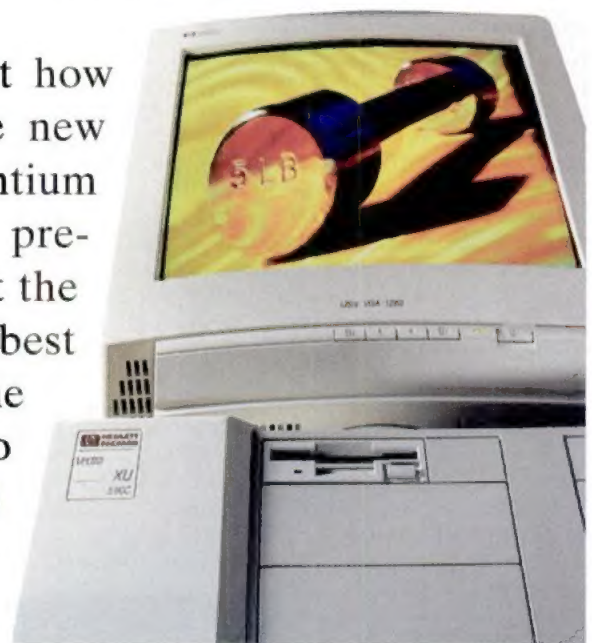
A Road Warrior's Wish
List107

COVER STORY

90-MHz Pentium PCs

Pentium Powerhouses

BY JIM SEYMOUR Just how much better are the new 3.3-volt 90-MHz Pentium systems than their predecessors? Who's got the best design and the best price? What are the important features to look for? We test 40 high-end systems to find out112



Aberdeen Super P90 VLPCI.....118	HP Vectra XU 5/90C.....160	Tagram Thunderbolt P90, PCI 90.....177
ACMA P90 PCI.....121	Initiati e Technology ITI 590 Pi.....160	Tangent PCI-590.....187
AMAX 90MHz PowerStation.....121	Insight PCI P90 SCSI.....162	Tri-CAD Vigor Pentium-90.....187
Ambra TP90PCI.....128	Mega Impact P90PCI/VLB+.....165	Xinetron Green Pentium 90MHz.....187
ARES Pentium Pro 90.....136	Memorex Telex Celerria LP90.....165	Zenon Z-Titan Pentium 90MHz.....188
AST Premia GX P/90 Model 733C.....136	MicroFLEX-VL/Pentium/90.....165	ZEOS Pantera 90.....189
AT&T Globalyst 600.....136	Micron P90PCI PowerStation.....166	
Axik Ace Power 586-90PCI.....143	Mitsuba Premier System-90.....171	Highlights.....114
CAF Lightning P9.....143	NETIS N590 Pentium System.....171	Editors' Choice.....115
Comtrade Professional P5/90.....147	No acor No a Pentium 90.....172	How a 3-Volt CPU Fits In.....116
Dell Dimension XPS P90.....147	Pactron Quake 9NSX90.....175	Suitability to Task.....118
Diamond DT 586-90.....153	Polywell Poly 586-90VLB.....175	Price/Performance Index.....120
EPS P90 Explorer.....154	Royal Media Master IV.....175	The Future of x86 Architecture.....124
FCS Green Pentium 90.....155	Sidus SCI9P590PDT.....176	Performance Tests.....128
FutureTech System 5490P.....155	Solmicro Arena PVi90.....177	Multiply Your Investment.....144
Gateway 2000 P5-90.....155	Sys Performance Pentium 90 Full Tower.....177	Summary of Features.....153
Hewlett Rand HR P5-90 Panther.....156		

Hardware

17-Inch Monitors:
The Bigger Picture

BY JOHN R. QUAIN Time was when a 17-inch monitor was a luxury to be had only by those who really needed one: graphics professionals, desktop publishers, and CAD users. But mainstream business users, too, are discovering the advantages of a bigger picture—such as getting a wider view of that huge spreadsheet or having more application windows open and accessible. With more competition in this fast-growing segment, performance is improving and prices are sliding. We look at 42 17-inch displays, ranging from costly high-end units to bargains you can buy for around \$650.....191

AcerView 76i.....202	Sony MultiScan 17se.....250
Addonics 172 GLR.....212	Samsung SyncMaster 17GL.....250
SuperMac SuperMatch 17 XL.....212	Samsung SyncMaster 17GLs.....250
ADI MicroScan 5EP.....212	Sceptre CL-617GL+.....251
Altima V-Scan 80.....216	Tatung Omniscan CM17MKR.....253
Amdek AM/817E.....216	ViewSonic 17G.....254
Apple Multiple Scan 17 Display.....216	ViewSonic 17.....254
ASTVision 7L.....220	Wen JK1775 Digital Control Color Monitor.....254
Compaq QVision 172.....220	Editors' Choice.....193
CTX 1765GM.....220	Highlights.....194
CTX 1785GM.....220	17-Inch Color Monitor Market.....199
ETC ViewMagic CA-1765SPL.....221	Performance Tests.....204
Goldstar Model 1725.....221	Summary of Features.....228
Hyundai HL-7682A.....221	
IBM 17P.....226	
IDEK/Iiyama VisionMaster MF-8617.....226	
Ikegami CT-17A.....228	
MAG DX17F.....229	
MAG MXPI7F.....229	
MiTAC Performance Series L1782.....233	
Mitsubishi Diamond Scan 17FS.....233	
Nanao FlexScan F550iW.....237	
Nanao FlexScan F560iW.....237	
NEC MultiSync 5FG.....238	
NEC MultiSync 5FGp.....238	
Nissei Sangyo/Hitachi SuperScan Elite 17.....238	
Nokia Multigraph 447X.....242	
Optique 4000TC.....245	
Orchestra MultiSystems' The Tuba.....248	
Packard Bell PB8517SVGM.....248	
Panasonic PanaSync C1791E.....248	
Philips Brilliance 1720.....248	
SDIS ErgoView 170.....248	
Radius PrecisionColor Display/17.....250	

Graphics

Desktop Presentations:
Captivated Audience

BY LORI GRUNIN No more boring slide shows? These ten presentation graphics software products have mastered ease of use for the most part, yet for many of these packages, integrating multimedia remains a challenge.....257



Action! for Windows 3.0.....260	2.0 for Windows.....287
Astound for Windows 1.5.....264	Editors' Choice.....258
Bra o! 2.0.....266	Highlights.....259
Compel 1.0a.....271	Suitability to Task.....260
Freelance Graphics for Windows 2.01; for OS/2 2.1.....272	LCD Projection Panels: Through a Glass Brightly.....262
Har ard Graphics 2.0 for Windows.....276	Presentation Alternatives.....270
Micrografx Charisma 4.0.....280	Performance Tests.....274
Microsoft PowerPoint 4.0.....282	Looking Ahead: Impact and Persuasion.....278
WordPerfect Presentations	Summary of Features.....284

Tired of scrolling around on your Windows screen to see all you need to see? Maybe it's time to trade up to a 17-inch display. Picture quality is up, prices are down (page 191).



NETWORK EDITION

Follows page 288

First Looks

- Moving a step closer to the paperless office.....NE1
- CorStream.....NE16
- ADC FiberMux SnapLAN Hub.....NE18
- Lotus ViP.....NE22

New & Improved

- PowerHub 7000.....NE25
- Annex Software 9.0.....NE25
- LanRover 3.0.....NE25
- Channels 1.1.....NE27
- CruiseLAN/PCMCIA, CruiseLAN/ISA, CruiseLAN/Access Point.....NE27
- FastGroup 4000/8000;

- FastBridge 1200.....NE27
- ThunderLAN.....NE28
- POWERfusion 2.2.....NE28
- Virtual On-site Technology.....NE28

Derfler & Greenfield

- When Companies Collide.....NE31

PC TECH

User-to-User

BY NEIL J. RUBENKING Creating environment variables that last from session to session; uninstalling DOS 6.x correctly.....289

Tutor

BY JEFF PROSISE Your Modem's Language: The AT Command Set.....291

Extending Your Apps

BY BRIAN PROFFIT Tuning Windows Applications Under Personal OS/2.....295

Toolkits

BY BOB FLANDERS Write Fax Apps with VB.....299

Power Programming

BY MATT PIETREK Which Win32 Is for You?.....303

Utilities

BY CHARLES C. EDWARDS Customize Your Group Icons.....311

PC SOLUTIONS

Hardware

SIMM trouble; what to do about non-standard local-bus systems; how long can floppy disks retain their memory?.....321

Operating Environments

Phantom files in the File Manager; the two paths of DOS.....324

Word Processing

Printing in landscape in WordPerfect for DOS 5.1.....336

Spreadsheets

Changing toolbar buttons' tooltip descriptions in Excel 5.0.....342

Graphics

Getting rid of unwanted fonts.....346

AFTER WORDS

- **Poetry software:** In search of that elusive verse
- **CD-ROM Pick Hit:** Poetry in Motion
- **Pre-reading:** Same & Different
- **Adventure:** Strike Commander CD
- **Spotlight on History:** D-Day Multimedia Encyclopedia
- **Quick Clips**.....423



Abort, Retry, Fail?

BY DON WILLMOTT.....428

ALSO IN THIS ISSUE

- Direct Marketing Connection.....289
- Marketplace.....387
- Premier.....387
- Classified.....396
- Business Cards.....413
- Reader Service Card.....411
- Index to Advertisers.....417
- Advertisers' Product Index.....418
- Coming Up.....420
- Editorial Product Index.....421



New twists in modern romance (page 428).

\$100 REBATE



**The EPSON ActionScanning
System gives you creative freedom
without creative financing.**





Everything you need to scan and edit text and graphics for under \$899*

Easy and affordable scanning for the PC is here. It's called the EPSON ActionScanning System. EPSON makes it simple to put text and images in your documents.

With 600 dpi and 24-bit color, the ActionScanning System captures crisp, clear images. Great results are easy to achieve with EPSON's exclusive built-in controls.

The ActionScanning System comes with everything you need for productive scanning, including top-ranked image editing software Picture Publisher 4.0 LE, TextBridge OCR, interface board and cable,

and a TWAIN driver for software compatibility. All this makes the ActionScanning System ideal for your home or office.

Considering that the entire system is available under \$899,* buying an ActionScanning System is as easy as using one.

To see how far your creativity can go, visit your local authorized dealer or call
1-800-BUY-EPSON.



*\$999 MSRP with \$100 manufacturer's rebate from 9/1/94 to 12/31/94. © 1994 EPSON AMERICA, INC., 20770 Madrona Ave., Torrance, CA 90503. For rebate coupon, dealer referral or warranty details, call 800-BUY-EPSON (800-289-3776). In Canada, call 800-GO-EPSON. In Latin America, 305-265-0092. EPSON, Picture Publisher and TextBridge are trademarks or registered trademarks of SEIKO EPSON CORP, Micrografix, Inc. and Xerox Imaging Systems, Inc., respectively. Do not scan published material without permission of the copyright holder.



Editor-in-Chief Michael J. Miller

Editor Robin Raskin

Executive Editors Rick Ayre, Bill Howard, Don Willmott

Director, PC Labs C. James Galley III

Senior Networking Editor Frank J. Derfler, Jr.

Senior Editors Christopher Barr (West Coast), David Greenfield (Networking and Communications), Brian Nadel (First Looks)

Managing Editor Paul B. Ross Assistant Managing Editor Dianne H. McDonald

Senior Associate Editor Ted Stevenson (Software) Associate Editors John Clyman (PCs), Gayle C. Ehrenman (After Hours), Leon Erlanger (Hardware), Carol Levin (Trends), Thomas Mace (Applications Development), Gail Shaffer (Networking and Communications), Sharon Terdeman (Technical Columns), Lance N. Ulanoff (Graphics) Technical Editor Neil J. Rubenking Senior Production Editors Shari L. Girouard, Kim Schueler Copy Chief Glen Boisseau Becker Staff Editors Tin Albano, Jamie M. Bsales, Kathleen Caster, Elisabeth H. Holzer, Vicki B. Jacobson, Eilyn J. McCasland, John Moore, Michael W. Muchmore, Michael Ryan, Craig L. Stark, Carol A. Venezia, Leslie Wygant, Anush Yeghazarian Senior Writer Robert S. Anthony Staff Writer William P. Flanagan Assistant Editor Adam A. Hicks Senior Copy Editor Jeanne Albrecht Copy Editors Jill Léger, Joseph N. Levine, Ann Ovodow, Michele Pepe, Asa Somers Assistant Copy Editors Jay Amster, Elliot Thomas Grant Layout Manager Linda Harms Assistant Layout Manager Shelly Fierston Senior Layout Editors Thomas DeVito, Lillian Gaffney Librarian Thomas W. Giebel Library Assistant Dolores Williams Senior Editorial Researcher Brad Stilwell Editorial Researchers Mary E. Behr, Eryn R. Brown, Angela Hickman, Brendon M. Macaracg, Todd Spangler, Jodi L. Wynblatt Editorial Assistant Melissa J. Perenson System Support Manager Craig Ellison PC Support Analyst Melvin Acevedo Production System Support Manager Patricia Perkowski Communications Manager Diana Garelik Assistant to the Editor-in-Chief Tara Solon Assistant to the Editor Rita Aprahamian Assistant to the Executive Editors Christina M. Evelyn Administrative Assistant Christina Okang Synop, PC MagNet Ken Hipple

Contributing Editors Bill Machrone (Publishing Director), Douglas Boling, Bruce Brown, Sheryl Canter, Ray Duncan, John C. Dvorak, Lori Grunin, Mitt Jones, Nick Lippis, Michael J. Mefford, Edward Mendelson, Charles Petzold, Alfred Poor, Jeff Proise, John R. Quain, Sal Ricciardi, Winn L. Rosch, Joe Salemi, Jim Seymour, Richard Hale Shaw, Barry Simon, Luisa Simone, Craig Stinson, M. David Stone

Senior Art Director Lisa A. Sergi Associate Art Directors Charles Conover, Curtis M. Fields, Donna Panagakos Associate Graphics Director David Foster Assistant to the Art Director Frieda T. Smallwood Contributing Photographer Thom O'Connor

Technical Directors Ben Z. Gottesman (Software), Nick Stam (Hardware) Testing Coordinator Steve Buchler Project Leaders Jeffrey D. Baher (Network First Looks), Amarendra Singh (Software), Robert P. Lipschutz (Networking and Communications), Jeff Mace (Graphics), Jay Munro (Applications Development), Richard Fisco (PCs), Michael J. Zulich (Hardware) Programmers Richard V. Dragan, Kenchai Prakobchart Product Testing Manager Charles Rodriguez Technical Analysts Daniel A. Begun, Laura Cox, Tim Crawford, John Garis, Margaret A. Piemonte, Deval Shah, Dan Smith, O. Ryan Tabibian Support Technicians Peter Bastide, Marino Delzotto, Bruce Kowalski, Denis Tom, Mark Valentine Operations Manager John R. Delaney Inventory Control Coordinators Rob Graydon, William Pagan, Mark Randall Administrative Assistant Jacqueline Paredes

Publisher Jim Stafford

Associate Publishers Anna Zornosa (West Coast), Lon Otremba (East Coast), Daniel Rosensweig, Michael Perkowski (Marketing) National Sales Manager Bill Stephen Business Manager Chris Eisenhardt Research Director Michael Van Engen Associate Research Director Jaime LeVine Assistant Research Manager Scott Gibson Marketing Manager/Network Edition John Wisdom Client Services Manager Steve Robinson Sales Development Manager Susan Federspiel Promotion Manager Lisa DiBenedetto Events Manager Dawn Gudelis

Senior Advertising Production Manager Lori Iaccino Advertising Production Manager Pamela Berkowitz Assistant Advertising Production Managers Susan Conrad, Robert Joy Senior Coordinator, Edit Production Mark Baard Coordinator, Edit Production Louise Laberge

Advertising Office: One Park Ave., New York, NY 10016-5802; 800 33 MAG AD, 212-503-5100

Ziff-Davis Publishing Company

Chairman Eric Hippeau

Business Media Group

President Ronni Sonnenberg

Group Vice Presidents Claude P. Sheer, Jeff Ballowe Vice Presidents Joseph Gillespie (Magazine Networks), Bob Bader (Central Advertising Sales), Michael Miller (Editor-in-Chief PC Magazine), Paul Somerson (Editorial Director PC/Computing), Al DiGuido (Group Publisher), J. Sam Huey (Publisher PC/Computing), Jim Stafford (Publisher PC Magazine), Don Byrnes (Publisher PC Week) Directors Susan Delman (Corporate Marketing), Brenda Wheeler (Public Relations), Ellen Atkinson (Training), Celia Canfield (Ziff-Davis Preferred Customer Program) Sales Development Director, Ziff-Davis Magazine Networks/ZDPC Jeff Bruce Co-Directors of ZD Benchmark Operation Bill Catchings, Mark L. Van Name Director, ZD Labs Bob Kane

Ziff-Davis Publishing Company

Presidents J. Scott Briggs (Consumer Media Group), Bob Brown (Computer Intelligence/InfoCorp), Robert Howells (Information Access Company), J.B. Holston III (International Media Group), Bill Lohse (ZD Expos), Michael Kolowich (Ziff-Davis Interactive), Ken Jeffers (Ziff Technology Group)

Senior Vice Presidents Baird Davis (Circulation), Rachel Greenfield Vice Presidents Tom McGrade (Assistant to the Chairman), James F. Ramaley (Circulation Services), Howard Skolnik (Controller), Herbert Stern (Creative Services), Bruce W. Bourne (General Manager), Rayna Brown (Human Resources), Roger Herrmann (Production), Rolf M. Wulfsberg (Research), Robert Ziff (Strategic Planning), Bill Machrone (Technology) Chief Information Officer Wellington Y. Chiu Internal Marketing Consultant Paul H. Chook Editorial Director Lewis D'Vorkin Executive Director, Information Systems Owen Weekley Executive Director, Marketing Services Jim Manning Production Director Walter J. Terlecki, Director of Licensing Jean Lamensdorf Director of Public Relations Gregory Jarboe

**Ziff Communications Company
Chairman and CEO Eric Hippeau**

Senior Vice President & Chief Financial Officer Bruce R. Barnes

Senior Vice President Steven C. Feinman

Vice Presidents J. Malcolm Morris (General Counsel and Secretary), T.L. Thompson (Business Manager), Timothy J. Mitchell (Controller and Treasurer)

Chairman Emeritus William B. Ziff, Jr.

Subscription Inquiries, Address Changes

Subscription Services: For subscription service questions, address changes, or ordering information, call toll-free 800-289-0429 in the U.S. and Canada; all other countries, please contact Ireland: 303-666-3190 or fax 303-666-3191. Or write to *PC Magazine*, P.O. Box 54093, Boulder, CO 80322-4093.

Subscription Rate: The subscription rate is \$49.97 for a one-year subscription (22 issues). Canada and all other countries, please add \$36.00 for postage.

Back Issues: For back issues (subject to availability), \$8 per issue (\$9 outside the U.S.), send check or money order to Back Issues Dept., Ziff-Davis Publishing Company, P.O. Box 53131, Boulder, CO 80322-3131.

Computer Select: *PC Magazine* is available on Computer Select, a CD-ROM published by Computer Library. For subscription information, call Computer Library at 800-827-7889, ext. 708.

How to Contact the Editors

We welcome letters. However, we cannot look up stories from past issues, recommend products, or diagnose problems with your PC by phone. Send your written questions, complaints, and compliments to *PC Magazine*, One Park Ave., New York, NY 10016-5802. Please include a daytime telephone number. Send electronic mail to MCI Mailbox 157-9301, to CompuServe address 72241,104, Internet address 157.9301@mcimail.com, or to PC MagNet (see below). *PC Magazine's* general number is 212-503-5255. The West Coast Operations number is 415-378-5500.

If you are dissatisfied with a product advertised in *PC Magazine* and cannot resolve the problem with the vendor, write (do not call) Jennifer Roth, Advertising Department, at the above address. Include copies of your correspondence with the vendor.

PC Magazine does not accept unsolicited manuscripts. We will pay \$50 for Solutions and Programming user tips and for Abort, Retry, Fail? submissions. If you submit artwork or newspaper clippings with Abort, Retry, Fail?, mark up the photocopy, not the original.

PC MagNet

PC Magazine operates PC MagNet, an on-line service of ZiffNet, hosted by CompuServe. To join, set your communications software for 7 data bits, even parity, 1 stop bit, and full duplex. To find the number nearest you, dial 800-346-3247. (In Canada, dial 800-635-6225, voice only.) At the Host Name prompt, enter PHONES. Follow the menus, note the number closest to you, then hang up and dial the number. At the HOST NAME prompt, enter CIS. At the USER ID prompt, enter 177000,5000. Enter PC*MAGNET at the PASSWORD prompt and PCMAG94 at the ENTER AGREEMENT NUMBER prompt. CompuServe members may join by typing GO PCMAG at any CIS 1 prompt. ZiffNet membership is \$2.95 a month, which includes access to *PC Magazine* Editors' Choice awards, Product Reviews Index, Newsbytes, ZiffNet Highlights and Information, and the Support Forum. Connect-time charges vary according to modem speed.



To obtain this issue's utility free of charge: Dial 617-231-4450, with your modem, to access the *PC Magazine* Utilities BBS. Enter your name at the prompt, and follow the menus.

Prodigy members can download *PC Magazine* utilities from ZiffNet Selections on Prodigy for a transfer fee of \$3 per program. Jump 'ziff select' and browse the computing topics for programs.

Permissions, Reprints

Material in this publication may not be reproduced in any form without permission. If you want to quote from an article or use *PC Magazine's* logo in conjunction with an Editors' Choice designation, write Chantal Lavelanel; for information on reprints in quantities of 500 or more, write Carol Peters.

PC Magazine Reviews

Except where noted: All *PC Magazine* reviews are of currently available products. Benchmark and performance tests are run on Compaq Deskpro 486/33M's.

Editorial and Business Office: One Park Ave., New York, NY 10016-5802. Editorial: 212-503-5255; Advertising: 800 33 MAG AD, 212-503-5100. *PC Magazine* is an independent journal, not affiliated in any way with International Business Machines Corp. IBM is a registered trademark of International Business Machines Corp. Entire contents copyright ©1994 Ziff-Davis Publishing Company, L.P. All rights reserved; reproduction in whole or in part without permission is prohibited. The following are registered trademarks of Ziff-Davis Publishing Company, L.P.: *PC*, *PC Magazine*, *PC Labs*, *PC MagNet*, *PC Magazine Award for Technical Excellence*, *PC Magazine Editors' Choice Award*. The following are trademarks of Ziff Publishing Company, L.P.: Abort, Retry, Fail?; Direct Marketing Connection; First Looks; Lab Notes; New and Improved; PC Marketplace; PC Solutions; PC Tech; Pipeline; Power Programming; Read Only; Trends; Tutor; User-to-User; Utilities; The Working Word.

It's the latest addition to the #1 selling line of personal information organizers. It features a pen-based graphical user interface, 512K of

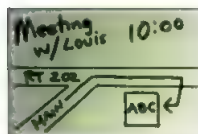


memory and all the tools you could ever want in a 10.5 ounce package. And the new "ultra-compact fax modem" only adds 1.27 ounces and requires no additional cables or setup for use. Best of all, it can remain attached to the Wizard and still fit in a pocket or purse.

The unit's built-in fax software permits users to send a drawing, a letter, or even an entire folder of documents. The software also provides

and connect to on-line services like CompuServe®.

A word processor with cut, paste, and a variety of text styles enables you to produce



directly on the screen using the Wizard's

And when it comes to time management, Wizard sets the standard. Four different calendar views, 3 phone directories, a

THE NEW WIZARD OZ-9520FX.

professional-looking letters. Completed documents can then be

stylus or your finger. Images can also be imported from a PC or

To Do list, and there's even a function that allows you to enter



the optional PenCell® spreadsheet card.



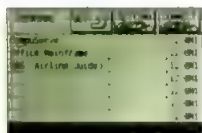
Using Computer Link software, data can be transferred to and from a PC or Mac®. And the optional wireless adapter enables Wizard's infrared technology to make this transfer effortless.



And if you ever have any questions there's even a built-in tutorial with explanations and diagrams for every function. But, until you get one, fax us at 1-800-74-SHARP. We'll answer your

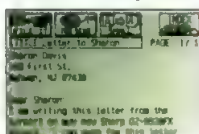
(IT WOULD BE EASIER TO TELL YOU WHAT IT DOESN'T DO)

a speed-dial directory and automatically creates a cover sheet for outgoing faxes. By entering the terminal mode the OZ-9520FX uses ASCII or VT-100



emulation to send and receive electronic mail

beamed to a colleague's Wizard or output wire-

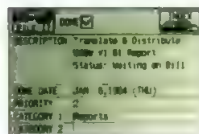


lessly to a PC-compatible printer with the optional infrared adapter.

Scrapbook allows you to draw and store hand-written words or maps and diagrams

Mac® into Scrapbook enabling telephone entries, for example, to have portraits or maps attached to them. A unique Filer system—of graphically represented folders—groups related information together by subject, making it ideal for project management.

annual events, like birthdays and anniversaries, so you'll never miss a moment.



The Wizard is your virtual office. No matter where the day takes you, creating a spreadsheet is as easy as inserting

questions about the OZ-9520FX and tell you about our high-end OZ-9500 and OZ-9600II series. Or call us at 1-800-BE-SHARP and we'll help locate your nearest dealer. It's just about the only thing this Wizard can't do for you.

THE NEW WORKPLACE™

WIZARD® Carried By The Most Organized People On Earth.

SHARP.
FROM SHARP MINDS
COME SHARP PRODUCTS™



COPIERS • FACSIMILE • LASER PRINTERS • NOTEBOOK COMPUTERS • COLOR SCANNERS • PERSONAL DIGITAL ASSISTANTS • CALCULATORS
CORDLESS TELEPHONES • TYPEWRITERS • WORD PROCESSORS • WIZARD® ORGANIZERS

©1994 Sharp Electronics Corporation. CompuServe® is a registered trademark of CompuServe, Inc. Mac® is a registered trademark of Apple Computers, Inc. PenCell® is a registered trademark of PenWare, Inc. Simulated screen image.

How to get eight people in the same conference room at the same time. ...

(Bagels and donuts not required.)





If you've ever tried to arrange a meeting, you know the degree of difficulty is somewhere between nailing a triple gainer with a half twist and eliminating the national debt. It's not for amateurs or the faint of heart. But all that's about to change. Introducing GroupWise 4.1, a new member in the family of Novell GroupWare. GroupWise capitalizes on the advancements of its predecessor—WordPerfect® Office 4.0—and offers features not found in any of its competitors. For instance, with the Busy Search feature of the integrated e-mail calendar/schedule program, you can quickly determine the best time for 8 (or 80) people to convene. Regardless of their locations or operating systems. More than message-based scheduling, GroupWise integrates task management, so you can delegate an assignment, track its acceptance and manage its completion before the first attendee arrives. With GroupWise, we've made it incredibly easy to set up a meeting. Of course, you still have the daunting task of keeping people awake in one. Call 1-800-370-8987 for your nearest certified reseller or to learn more about Novell GroupWare, the perfect way to put people together with information.



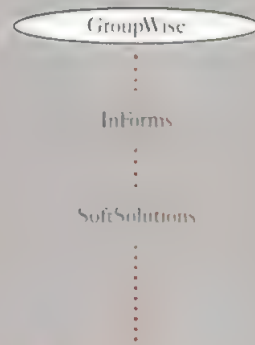
GroupWise 4.1—Comprehensive integrated e-mail, calendaring, scheduling and task management. GroupWise 4.1 enables you to share information across almost any platform, gateway or network.



InForms—More than an electronic forms program. Now you can create and design forms and views, access multiple databases in real time and, via e-mail, digitally sign forms requiring immediate approval.



SoftSolutions—The leader in document management solutions. You can secure information and access data (text, graphic or video) anywhere on the network, regardless of its application or platform.



GroupWise™

NOVELL

GroupWare



Why IBM for Client/Server.

Client/server computing is great for your people because it gives them easier access to more information. It's great for your business because it removes barriers between existing systems, giving you new flexibility to improvise, to reorganize, to reengineer.

So your question isn't whether to explore client/server, it's what to look for in the people who help you, and here's a suggestion. If they don't have a long list of references in multiplatform, multivendor integration and if they don't have solid knowledge of your kind of business, call someone who has. Someone like IBM.

We have more experience with more kinds of platforms, networks and industry applications than anyone. So when we custom-tailor your solution, we can be more objective about your options than single-platform vendors and more aware of your needs than third-party consultants.

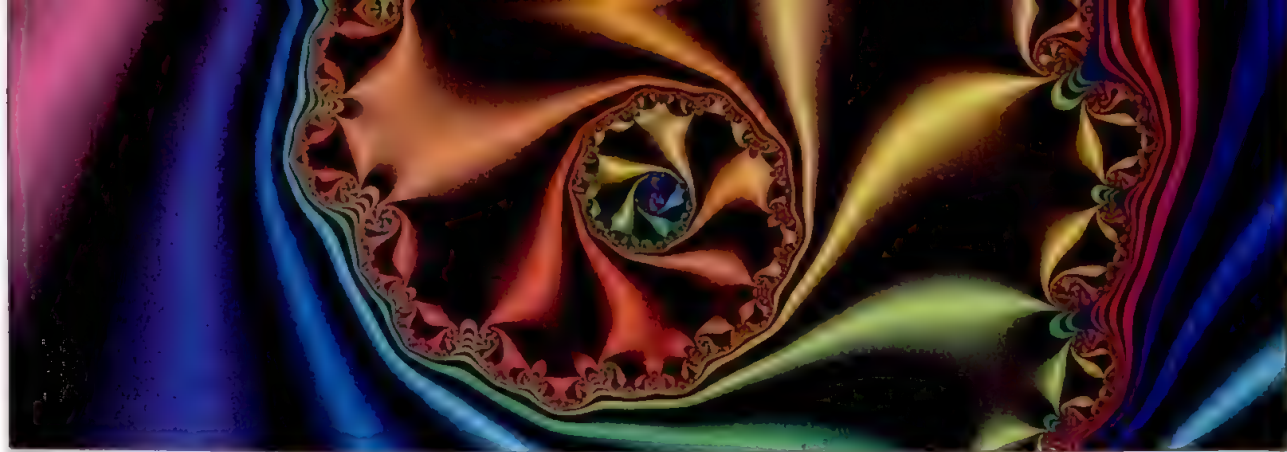
Also, we keep careful track of everything we learn. Each client/server solution is unique, but we'll compare your situation with ones we've faced before to give you the direct benefit of real-world experience. What's more, we can help you at any stage—from initial consulting to implementation—and we now have 40 IBM Open System Centers worldwide for testing multivendor solutions before installation.

Nobody wants to be a vendor's rehearsal, and with us you won't be. We've built hundreds of successful client/server solutions, and we're eager to help you with yours.

*For a quick response, ask
for extension "star" 802 at*

1 800 IBM-3333.





GoldStar

What's The Big Idea?

Whatever idea you have in mind, watch it come to life on one of the big color monitors from Goldstar. With flat square tubes and a sharp edge-to-edge display, they give you room to open your windows wide and power to handle the most demanding graphics applications.

If you're big on the environment, our monitors are MPR II and Energy Star compliant. And if you're big on Macs, we're also Macintosh compatible.

Backed by a 2 year parts and labor warranty, our monitors have a world-wide reputation for value and reliability. So if you've been thinking about expanding your horizons, take a look at the monitors from Goldstar. The idea is catching on.

	Dot Pitch	Max. Resolution	Max. Ergonomic Resolution	Horizontal Scan	Dynamic Focus	Digital Controls	DPMS	100-280 VAC
Model 1520 15" FST w/ Invar mask	.28mm	1280 x 1024	1024 x 768 (76Hz)	30-65KHz		Yes	Yes	Yes
Model 1725 17" FST w/ Invar mask	.28mm	1280 x 1024	1024 x 768 (76Hz)	30-65KHz	Yes	Yes	Yes	Yes

GoldStar
MONITORS

All The Qualities You're Looking For

Goldstar U.S.A., Inc. 1000 Sylvan Avenue, Englewood Cliffs, NJ 07632

All brand names or trademarks are property of their respective owners. The Energy Star emblem does not represent EPA endorsement of any product or service.



CIRCLE 371 ON READER SERVICE CARD

Letters

THE TIMES ARE CHANGING

The issue devoted to "The Changing Office" (June 14, 1994) contains the best analysis and evaluation of workgroup technologies in any publication. Few can sort out the applications, enabling technologies, and future implications of this dauntingly complex category, but you did a tremendous job.

*Cornelius Willis
Redmond, Washington*

PC Magazine's definitive review of the next generation of group productivity software was thoroughly enjoyable. It helps a nontechnical user like myself stay fully abreast of things to come and allows me to hold my own against the marketing hype users are barraged with nowadays.

*Ben Teehankee
via the Internet*

CONVERGING ON CONVERGENCE

Thanks for the map summarizing the various convergence tests currently in progress ("Powerful Convergence," June 14, 1994). An addendum to that chart would be the tests involving electrical utilities. Several utilities are testing a system using standard copper coaxial cable, a more expedient and inexpensive way of connecting customers to interactive services. Electrical utilities—not the cable and telephone companies—may actually be the first to deliver the information highway to your home.

*Lewis Perdue
via the Internet*

BBSs' ROLE ON THE HIGHWAY

BBS-based telecommunications services will have their place on the information highway ("The Electronic Watercooler: The Bulletin Board System," June 14, 1994) largely because of their ease of use and inexpensive nature. BBSs can provide a level of service to businesses and ordinary Americans who might otherwise be disenfranchised from the information highway because of a lack of resources.

*Shane Anderson
via the Internet*



*This was a comprehensive
analysis and evaluation of
workgroup technologies.*

ROUTERS UP!

Your article "Speaking LAN to LAN" (May 31, 1994) was quite impressive. As someone who is deep in the trenches of wide area networking, I quite often get questions regarding routing, bridging, digital links, and the like, and I felt your story was an accurate overview of what dial-up routing provides. You covered all the bases, including the major router manufacturers' low-end routers that can compete with high-usage dial-up solutions, and how a permanent digital link could be an economical solution.

*Tim Banaszak
Juneau, Alaska*

CHOMPING AT THE BIT

Congratulations on your excellent coverage of 32-bit operating systems ("Life After DOS," May 31, 1994). Your acknowledgement of the existence of Unix as a viable desktop option is important, especially since Unix is becoming a much more user-friendly OS. The underlying complexity of Unix is not a curse but represents an incredibly rich resource of programming/editing tools that one comes to respect and treasure with experience.

*Laurence Josserand
via the Internet*

The round-up examining 32-bit operating systems was interesting. It would have been more useful had it included specific information regarding a potentially adverse consequence of "upgrading": incompatibilities of popular DOS and Microsoft Windows 3.1 applications. Very few corporations can afford to scrap everything; we have to upgrade in phases, without disrupting operations.

*Elmer P. Smith
via the Internet*

Your review of 32-bit operating systems was very informative, and the performance test results were particularly interesting. But you should also have run the same tests on 16-bit operating systems (DOS and Windows 3.1) for comparison. Granted, you would have to simulate multitasking, but this would still show which 32-bit operating systems really have punch and which ones provide little or no added benefit.

*Kevin R. Jones
via PC MagNet*

The greatest disappointment of your roundup is that you did not review Linux, a public-domain Unix system available through the Internet. The hardware constraints on this product are as minimal as those of OS/2. Although its emulation abilities are limited, Linux's capacity to develop applications is incredible.

*Hao-yung Chen
via the Internet*

• Users can access Linux through several locations on the Internet, including via ftp at sunsite.unc.edu.—Ed.

UPGRADE ALTERNATIVES

It was a pleasure to read your review of Cyrix's Cx486DRx2 CPU upgrade series (First Looks, "Cyrix Chip Gives New 486 Life to Old 386 Systems," May 31, 1994). I've been wanting to upgrade my system's processor, and this is the first impartial review of a chip upgrade I've seen.

*James McCurley
Plattsburg, Missouri*



THEY SAY VALUE IS GETTING WHAT YOU PAY FOR. WE SAY IT'S GETTING MORE.

If the nineties are about getting value for your dollar, then the Ascentia™ 800N is truly the notebook of the decade.

Because although it has a feature list putting it right up there in the high performance class, it also has a price tag that will have you wondering if it's attached to the right machine.

For starters, the 800N gives you Intel's powerful 486DX2/50MHz processor. Plus hardware accelerated local bus graphics.

Bottom line, you'll be amazed not only by what you can do, but by how fast you can do it. The 800N manipulates numbers faster, handles graphics faster, basically does whatever you want it to do, faster.

Then there's AST Works™-Mobile Edition. A unique interface that includes software tailored especially for the mobile professional makes you productive instantly. So it's easier to orga-

nize files and quicker to find your way around applications.

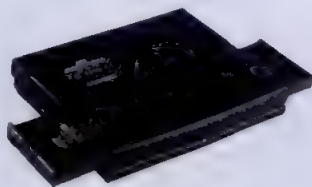
We've also given you not one PCMCIA expansion slot, but two. So you can add a data/fax modem to access E-mail and check on-line services, and there's still an extra slot to add an Ethernet, token ring or SCSI card.

Oh, and there's another useful feature you won't find on many notebooks: a removable floppy drive which can be replaced with a second battery pack to double battery life, giving you a total of up to six hours.

Not only that, but you get the added peace of mind of our three-year worldwide limited war-

ranty, 48-hour rapid repair service* and around-the-clock telephone support.

Call 800-876-4AST for more information about the Ascentia 800N. If you haven't already rushed out and bought one.



Out with the floppy and in with a second battery pack. Battery life is instantly doubled.

Ascentia 800N

Intel 486SX/33 MHz or
Intel DX2/50MHz processor
(3.3 volt)

9.5" diag. Dual-Scan
STN color display

VL bus hardware
graphics accelerator

250MB or 340MB
hard drive

4MB RAM standard,
expandable to 20MB

2 Type II or 1 Type III
PCMCIA slots

SmartPoint 19mm trackball

NiMH battery

8.8"(d) x 10.4"(w) x 1.7"(h),
5.9 lbs.

Pre-loaded with
AST Works-Mobile Edition

YOU'LL LIKE THE WAY WE WORK

AST.
COMPUTER

LETTERS

SEEING THROUGH THE MYST

It's easy to agree with your positive evaluation of *Myst* (After Hours, June 14, 1994). But *Myst* works even better on a Macintosh. On the Mac, the game worked right out of the box, while under Windows, I had to jump through hoops to

get it to run. Seeing the Mac version affirms that it is indeed possible to have good games in a Windows-style environment.

*Matt Miller
via the Internet*

PROBLEM SOLVED

In the First Looks review "WorldPort 14.4 Fax/Data Modem: Install with Care" (May 31, 1994), *PC Magazine* noted that

this U.S. Robotics modem will prove to be a terrific performer—as long as you don't use the provided Phoenix drivers. Since then, U.S. Robotics has fixed the driver problem. Users may call 708-982-5151, send e-mail via the Internet to support@usr.com, or send a fax to 708-933-5552 and request the new drivers.

*Michael Seedman
Vice President, U.S. Robotics Inc.
Skokie, Illinois*

CORRECTIONS AND AMPLIFICATIONS

Several photographs were transposed in *PC Magazine's* review of 70 notebook computers ("The Spectrum of Choice," August 1994). The affected photographs were in "Coming Attractions," our overview of upcoming systems (page 173), and in the sidebar reviews of docking station units (starting on page 159). The correctly identified photographs are reprinted here.



In clarification of Robin Raskin's Pipeline column "Publish or Perish, Internet Style" (July 1994): *PC Magazine's* Internet server is a complement to the magazine and a service for our readers. The server is not intended to be the sole source of *PC Magazine* utilities; posting these utilities on the Internet is welcomed. They can be copied, but they are copyrighted. You may distribute the utilities to others provided no charge is involved. The making of copies or the use of any portion of *PC Magazine* utilities for commercial purposes is prohibited.

Our roundup of high-end graphics accelerator cards ("Bit Blasters," June 28, 1994) incorrectly stated that the Diamond Stealth 64 did not have on-line help in its InControl Tools application.

In the joint review of Editors' Choice winners Norton pcAnywhere for DOS and Norton pcAnywhere for Windows ("How to Be in Two Places at Once," August 1994), we mistakenly asserted that neither version of the product offers drive remapping. The DOS version does offer this feature; pcAnywhere for Windows does not.

HOW TO WRITE TO PC MAGAZINE

We welcome your comments and suggestions. Please send correspondence to Letters, *PC Magazine*, One Park Ave., New York, NY 10016-5802. You can send electronic mail to our Internet address 157.9301@mcimail.com, or you can upload it to PC MagNet (see page 12 for access information). You can also send e-mail to individual editors. Type GO PCMSTAFF on ZiffNet for a list of addresses. All letters become the property of *PC Magazine* and are subject to editing.

"Wow, I Could've Had a V.34!"

Introducing the True V.34 28,800 bps Sportster Modem from U.S. Robotics.

Before you buy any other modem, check out the new Sportster V.34 from U.S. Robotics; the fastest, most reliable data/fax modem available today. Because the Sportster V.34 operates at an incredible 28,800 bps, it saves you phone and on-line time charges. And because the Sportster utilizes true ITU-T V.34 standard protocol, it's fully downward compatible with 14,400 bps and Rockwell V.FC™ modems.

Sportster V.34 is more than just fast, it's twice as fast as most modems sold today. Setup is simple. It's highly intuitive. And it comes complete with over \$300 worth of free introductory offers for on-line services, plus menu-driven QuickLink II® data and fax software. Like its predecessors, the Sportster V.34 is affordable, too -- just \$329 suggested list price.

Call 1-800-845-0908 and ask about the Sportster true V.34 today. You simply can't buy a faster modem.



Sportster®



1-800-845-0908

U.S. Robotics®
The Intelligent Choice in Data Communications

U.S. Robotics, Sportster and the U.S. Robotics logo are registered trademarks of U.S. Robotics, Inc. QuickLink II FAX® is a registered trademark of Smith Micro Software, Inc.

CIRCLE 866 ON READER SERVICE CARD

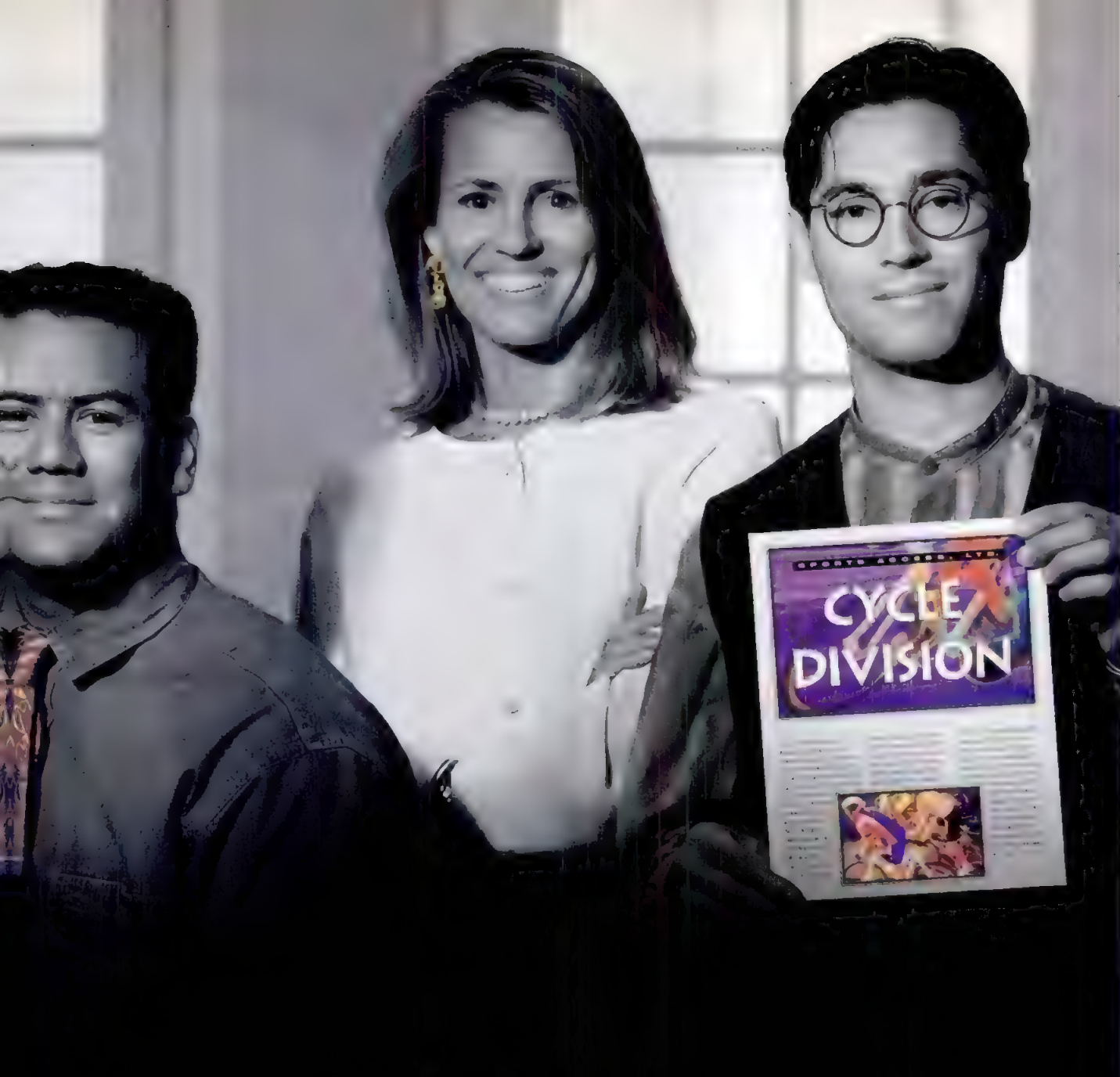
2009



Encourage exhibitionism.

Get the new HP DeskJet 1200C printer. \$1,699.

© 1999 Hewlett-Packard Company. All rights reserved.



*Clear, vivid, 300-dpi color
with ColorSmart.*

*LaserJet compatibility
and networkability.
600 x 300-dpi text with
Resolution Enhancement
technology.*

*\$1,699 list price, actual
price may be lower.*



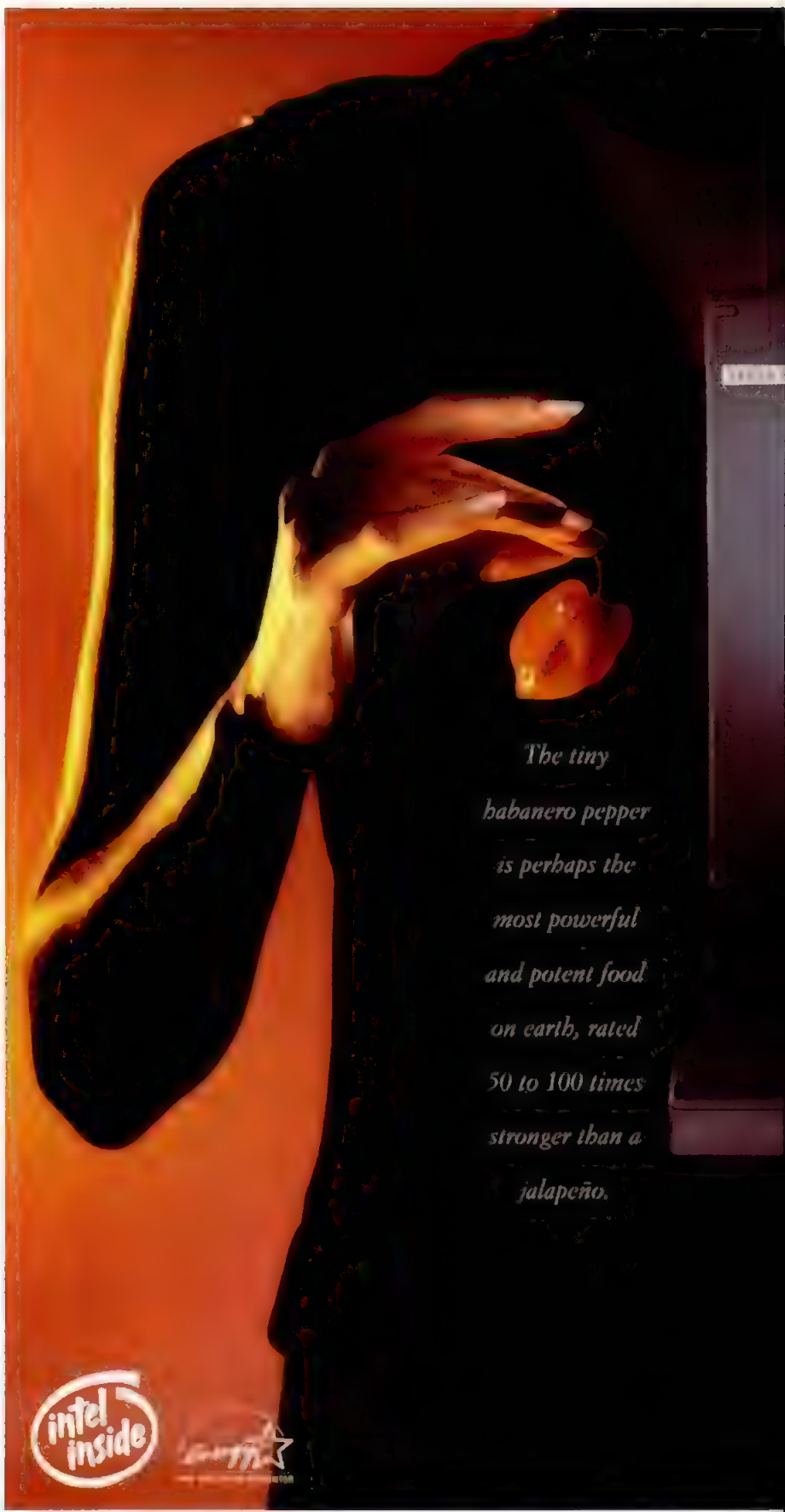
*The speed, stamina and
reliability you expect from HP.*

*For more information
and print samples call
1-800-821-8440, Ext. 8581.**

HP Printers



ONLY
MOTHER
NATURE
PACKS
MORE
POWER
INTO SUCH
A SMALL
PACKAGE.



*The tiny
habanero pepper
is perhaps the
most powerful
and potent food
on earth, rated
50 to 100 times
stronger than a
jalapeño.*





Here's a hot little number guaranteed to set your imagination on fire.

Presenting the Versa™ S notebook computer from NEC.

VERSATILITY

Perhaps the most powerful notebook pound-for-pound (actually, starting at about 4 lbs.*) on earth, thanks to the availability of an i486™ DX2/50 processor with on-board local bus video, up to 12 MB RAM and 260 MB hard disk storage. The Versa S is, in dimension, no larger than a piece of notebook paper. But that didn't stop us from packing it with an unusually long list of standard features. Choose from a brilliant 9.5" color TFT, enhanced color DSTN or monochrome LCD display. It features a large keyboard with an accurate



SurePoint™ pointing device,

PCMCIA Type III capabilities, serial, parallel, SVGA and keyboard/mouse ports. Yes, it folds to a svelte 1.4" inches. For more information, call



1-800-NEC-VERSA or visit an authorized dealer. The Versa S notebook. It's got the kind of powerful kick that would impress even Mother Nature.

**SEE, HEAR
AND FEEL THE
DIFFERENCE.**

NEC

If you've ever owned a copy of Norton Utilities®, you know you don't need a super-hero's cape to have magic-like powers.

Famous for its daring rescues and recoveries, Norton Utilities is one of the most honored software programs in the history of personal computing. And now there's new Norton Utilities 8.0.

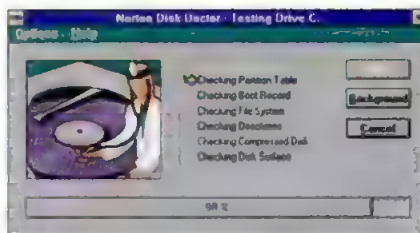
The first software package to combine true Windows recovery

Like Speed Disk, Norton Disk Doctor runs in the background.

and repair in one great package.

Our new

System Watch monitors virtually everything going on within your Windows environment. What's more, it provides real-time crash protection by alerting you to any



complete diagnostic tool set for analyzing all of your computer's hardware

components from drives to video.

There's also our new Interrupt Conflict testing to help eliminate conflicts and their subsequent lock-ups and to make it easier for you to

AFTER YEARS OF SAVING DOS USERS, NOW YOU CAN MAKE THE WORLD SAFE FOR WINDOWS, TOO.



Now you can make the world safe for all the PC users in your company whether they're running the latest version of DOS or Windows

potentially dangerous situations that could result in system failure and the loss of your data.

There are still several other new Windows utilities for trouble-shooting and repairing even the most challenging of Windows problems. Including INI Tuner, INI Tracker, INI Advisor, INI Editor and File Compare. And there are all the classic DOS utilities you've come to rely upon.

A MONUMENTAL NEW UPGRADE.

Both Speed Disk™ and Disk Doctor® now operate in the background. Providing continuous disk optimization and file system analysis and repair.

You'll find support for the widest range of compression formats under both DOS and Windows. In addition, there's a

install new devices on your system.

It all adds up to a major upgrade that InfoWorld rated a staggering 9.4 out of 10 in their May 9, 1994 review.

And, if you are one of those MIS super-heroes, ask about our new Norton Utilities Administrator™. It's the fast and easy way to distribute Norton Utilities 8.0 to every desktop in your office.

Just zap on over to your local computer retailer or visit your software store today.

Or to receive more detailed purchasing information, call us at 1-800-628-4777, ext. 9135.*

So for maximum protection, always boot your PC with Norton Utilities 8.0 at the start of your day.

It'll make your world a happier and safer place.



SYMANTEC®

*For more information in Canada, call 1-800-667-8661. Symantec, Norton Utilities and Norton Disk Doctor are registered trademarks of Symantec Corporation. Norton Utilities Administrator and Norton Speed Disk are trademarks of Symantec Corporation. All other brand names or trademarks are the property of their respective holders. ©1994 Symantec Corporation. All rights reserved.

Trends

TRENDS & TECHNOLOGY SHAPING THE PERSONAL COMPUTER MARKET

Answer the Softphone!

Microsoft, Novell plan telephony strategies.

We've grown to love the telephone. It's simple to use, accessible, and brings people closer together. Now, thanks to an emerging technology called CTI (Computer Telephone Integration), PCs are able to augment and even become telephones, enabling us to

communicate in ways that have been impossible until now.

A new kind of software called "soft-phones" has emerged, which lets Microsoft Windows-based PCs perform standard telephone functions. These programs display a computer image of a telephone on the screen, and you place calls, forward calls, and conference calls simply by using your mouse and speaking into your telephone. Some programs require new PC telephone boards and handsets.

Your PC can handle incoming calls as well. When a call comes in, you get a pop-up dialog box on screen; if you have caller ID, the incoming phone number and the caller's name comes up on-screen as well. You can then process your calls more intelligently, forwarding calls to your pager or your voice mail. Or you can launch a database and automatically retrieve information.

A number of proprietary solutions already exist in the growing telephony market, but recently, the computer giants Novell and Microsoft have separately forged paths toward standardization. In May, Novell introduced Telephony Services, which is

based on a standard jointly developed with AT&T called TSAPI (Telephony Services Application Programming Interface). Using Telephony Services, you establish a physical link between a NetWare server and an in-house telephone switch or PBX (Private Branch Exchange). This approach requires no additional hardware at the desktop. When you place a phone call on your PC, the request goes to the NetWare server, which translates the message and forwards it to the PBX. A number of applications have already shipped that conform to TSAPI.

Microsoft's effort, called TAPI (Telephony Application Programming Interface), establishes the telephone link at the desktop instead of at the server and requires extra hardware at each PC. There are two specifications: one to write drivers for telephone equipment and one to create end-user telephony applications. All call requests pass through a DLL provided by Microsoft, which then passes the requests down through the appropriate drivers and telephony hardware. The TAPI specification has been available since December 1993, and it will become an integral part of Chicago, the upcoming release of Windows.—*John Garriss*



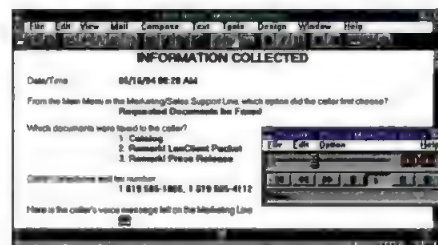
E-Mail by Phone

Checking your e-mail is a breeze when you're at the office, but what do you do when you're on the road? The answer may be as simple as picking up the telephone and pressing a few buttons.

Simpact Associates (800-488-4188) has released Remark! Phone Client, Version 2.0, a development kit for creating interactive telephone scripts for remote callers accessing Lotus Notes databases. The kit includes Phone Notes from Lotus, which is a set of Notes forms that provide telephone access to Notes database information.

When remote users call in, they're greeted by a voice that guides them through various locations within the Notes database where they can scan unread messages, listen to messages, and send digitized voice responses.

Perhaps even more useful, Notes administrators can have callers fill out Notes forms



Lotus's Phone Notes is a platform for emerging telephony applications.

via phone. For example, a caller can sign up for a company presentation by answering questions on the telephone. When the caller hangs up, the associated Notes form is forwarded to the appropriate person or routed to a group.

Other companies have gotten into the act as well. WordPerfect (recently acquired by Novell) offers Telephone Access Server, an add-on to WordPerfect Groupwise that lets you listen to your e-mail, scheduling information, and personal calendars via voice mail. And Edify Corp. (800-944-0056) has expanded its Electronic Workforce software to provide hooks for applications such as Notes, cc:Mail, and Microsoft Mail over the phone.

To see how this technology works firsthand, call Lotus's interactive demo of Phone Notes at 800-991-3366.—*John Garriss*

Pipeline *By Robin Raskin*

Shareware: Doomed or Not?

Shareware isn't doomed unless you're thinking about the game DOOM, which has brought both gaming and shareware to a new level. Now, with commercial software prices lower than ever and with the huge success of a small but visible segment of shareware publishers, it's time to take another look at the changing scene.

Last year was a shakeout period for shareware publishers, according to the results of a survey spearheaded by Steve Hudgik of the Shareware Information Service in Tualatin, Oregon. Small publishers (those with less than \$75,000 in sales per year) experienced up to a 30 percent decline in sales from 1992 to 1993. And



there's been a 10 percent decline in the price of shareware. Nearly 20 percent of those who were in the business in 1992 reduced their prices in 1993. And top-notch products such as Automenu, PC-File, and PC-Write are on their last strolls down memory lane.

I bring all this up because we just finished judging the results of a Ziff-Davis Shareware Awards contest. There are hun-

dreds of thousands of shareware packages available, and we received more than 500 new or upgraded packages. The entrants ranged from the sublime to the bizarre. The winners will be announced in our October 25 issue, and the finalists' code will be available for downloading at that time.

A glance at the 50 finalists reminds me that publishing software as shareware works best when it falls into certain well-focused genres. For example, shareware works well if you've got a niche product that you market to a select few. Some of our finalists, such as

Cross-Stitch Designer and Grocery Manager, fill important if not vast voids left empty by the large software companies.

Shareware has also done well on the "small is beautiful" principle. Elegant DOS utilities such as Directory Maven and 4DOS have astounding longevity. Drag and File is a perfect complement to Microsoft Windows and doesn't require you to buy into the enormity of Norton or Symantec packages.

One of the most astounding shareware success stories is in the games arena. Wolfenstein 3D from Apogee and DOOM from id Software epitomize what's known as hookedware. DOOM was created as a trilogy; you get the first episode for free and the second and third episodes when you register. An estimated five to seven million people play the first episode. There were 75,000 registered users at last count, and DOOM frenzy is spreading.

The 3-D realism and networked play that put DOOM on the mass-market map are part of DOOM II, which is available only as a retail product. The folks at id used shareware to break into commercial programming. Other shareware publishers earn big bucks by doing contract programming or customization work. Good examples are authors such as Eric Robichaud, who has a screen saver he customizes, and Rob Rosenberger, who has a popular phone dialer he integrates into systems.

Innovative shareware marketing is another way to get noticed. Datastorm, for instance, put a message in its shareware version of Procomm that told users if they liked the shareware version they should go to stores and ask for the next version. McAfee garnered attention by calling itself "the first electronic distributor." Magee Software took Automenu to market by saying it sold one million copies "direct."

Shareware is not doomed. It's alive, well, and bound to get even more innovative in the future.

Robin Raskin is the editor of PC Magazine.

Balancing Monitor Color Correctly

MOST OF THE 17-INCH MONITORS reviewed in this issue's cover story have color-matching controls that help you manually adjust the display. The colors you see on your monitor, however, may not match the output of your color printer.

To correct this, you could eyeball the screen and the output, use the monitor's color-matching controls to make adjustments manually, and waste time and money with trial-and-error printing. Or, if your display comes with Colorific, a color-management utility developed by Sonnentech, you can automatically match your display to your printer.

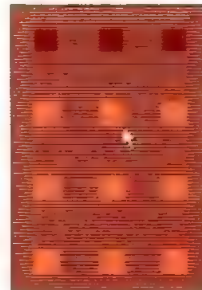
Before Colorific, software color-correction was possible only with professional color-matching products from Pantone and Electronics For Imaging. Today Nanao bundles Colorific on its 17-inch FlexScan moni-

tors at no extra charge. Mitsubishi also includes Colorific in its Diamond Match Color Calibrator Kit on all its monitors at no additional charge. Sonnentech expects other vendors to offer Colorific, as well.

Colorific works under Windows with Kodak's Precision color-management system, which will be built into Chicago. Using a predefined profile of your monitor and color printer, Colorific establishes a device-independent color space so you can accurately print the colors you see on-screen. The program leads you through a series of different-colored screens, and you choose the colors that work best for you. It sets your monitor to a standard 5,000 degrees Kelvin white mark and a gamma of 1.8 (a gamma is a measure of the relationship between the brightness and voltage of the

monitor). The colors are then reset and balanced based upon your responses.

Colorific was made to be paired with any color printer for true fidelity with your monitor, though it works fine as a standalone



Colorific measures the red, green, and blue output of your monitor and adjusts on-screen colors to match printed output.

utility to color-correct a monitor and make the colors more pleasing to your eye.

While Colorific may not correct colors as precisely as more expensive colorimeters, spectrometers, and densitometers used by professional printers, it does give a monitor a marked advantage.—*Christopher Barr*

Getting the Bigger Picture for Less

ONE OF THE LAST THINGS SHOPPERS generally consider when buying a PC is the monitor's option set. But it's the little details about monitors that end up driving you nuts. "Whites that aren't quite white, screen jitter or flicker, areas that change shape when they change color, uneven focus across the screen," are the major shortcomings of monitors today, according to NEC Technologies director of marketing Wayne Hinson. "It's the subliminal things that count."

The bottom line? Don't buy less than a 15-inch monitor and insist on a .28-mm dot pitch or better, MPR-II radiation protec-

tion, and energy-saving power-down capabilities. Six months from now, on-screen digital controls, longer warranties, and a wider array of distortion adjustments should be standard issue for 15-inch or larger midpriced monitors.

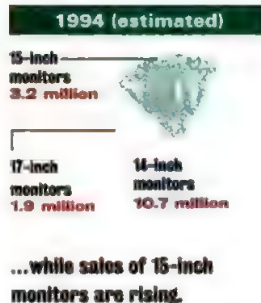
Monitor vendors are also planning a major enhancement later this year. A monitor that implements

North American Sales of Popular Color Monitor Sizes



Digital Data Channel (DDC), a Video Electronics Standards Association (VESA) specification for automatic configuration, will be able to tell a DDC-compliant graphics card its refresh rates at different resolutions, its power-conservation capabilities, and its model number to help match video drivers.

DDC should help eliminate flicker and other annoying distortions that result from improper monitor configuration. NEC's Hinson says



a look at the new generation of 15-inch monitors that offer improved features at lower prices. In fact, now that Dell's 15-inch monitor is just \$60 more than its 14-inch, many Dell PC buyers are opting for the larger monitor.

Street prices on 15-inch (and 17-inch) monitors have slipped by about \$100 this year. Feature-rich, midrange models such as the NEC MultiSync 3V and 3FG and Sony's .25-mm Multiscan 15sf are now available for between \$400 and \$550, while high-end monitors such as the MultiSync 4FG or the Nanao 340iW top out at around \$650. —Mike Hogan

25K to 80K per page of text.

Kalman Technologies is working with Motorola's Advanced Radiodata Research Centre to adapt a fax compression technology invented by Compression Labs called Combined Symbol Matching (CSM) to the wireless networks. By adding new compression algorithms, they have increased the level of compression by 60 to 80 percent, says Swift. A compressed fax, which is between one-quarter and one-eighth its original size, costs less to transmit. That's compact enough to travel over the wireless radio networks such as Ardis and RAM Mobile Data at a cost of \$1 to \$1.50 per page, Swift predicts.

The plan is to have CSM ready by the first half of 1995, and to get PDAs and notebooks communicating with the fifteen million fax machines in use today. —Carol Levin

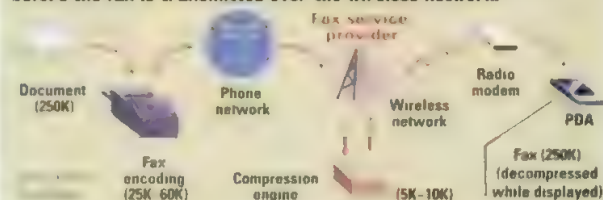
Incoming Fax for Your PDA

IF YOU SEND A FAX TO A PDA, you're in for a whopping bill that could run you anywhere from \$6 to \$13 per page. Wireless fax/modems are denied half of their faxing potential because it is cost-prohibitive to send the large data files that fax machines generate over the narrow bandwidth of the radio channel. Technically, it's easier to send than to receive a fax. Getting the two on a par is the goal of two Vancouver-based developers.

"Taking e-mail and converting it into fax file format is a fairly standard technology," says Stephen Swift, president of Kalman Technologies, a software developer that's working on a compression technology to enable PDAs and wireless modems in notebooks to receive as well as send faxes easily and inexpensively. "Inbound capture is far more difficult." The problem is two-fold: the complexity of the message routing protocols and the sheer size of the fax files, which range from

Wireless Faxing

Kalman Technologies and Motorola are developing a compression technique that enables existing fax machines to send faxes to mobile users. Compression takes place at a fax service provider before the fax is transmitted over the wireless network.



Top Retail Software

Current ranking	Last issue	Product/company
1	1	MS-DOS 6.22 Upgrade Microsoft Corp.
2	—	Procomm Plus for Windows 2.01 Datastorm
3	2	Procomm Plus for Windows 2.0 Datastorm
4	—	CorelDRAW 5 Upgrade Corel Corp.
5	13	Corel Gallery 1.0 Corel Corp.
6	5	MS Windows 3.11 Microsoft Corp.
7	15	MS Works 3.0 for Windows Microsoft Corp.
8	—	Peachtree Accounting 3.0 for Windows Peachtree Software
9	6	MS Excel 5.0 for Windows Upgrade Microsoft Corp.
10	10	Delrina WinFax PRO 4.0 Delrina Corp.

This list ranks PC business programs according to the total number of copies shipped to stores and resellers in the week ending July 23, 1994. The list is based on shipments to more than 12,000 retail locations. It does not include sales made directly by software publishers and cannot be interpreted as a picture of the entire software market. Sales information adapted from a compilation by Ingram Micro.

Relief in Sight for PCMCIA Troubles

THE IDEA OF POPPING A CREDIT card-size modem, network adapter, or storage card into your notebook PC was supposed to make mobile computing more convenient, but the flexibility of the PCMCIA standard has turned out to have its share of headaches. As the industry matures and learns from its mistakes, relief may be in sight.

Briefs

SENDING E-MAIL IN JAPANESE, FRENCH,

or classical Greek for that matter is now possible with Gamma UniType, a new multilingual Windows program from Gamma Productions (800-974-2662), maker of Multi-Lingual Scholar. UniType installs UniCode extensions, which support 175 languages, into Windows, and lets you localize all your Windows apps. And for multilingual Windows word processing, Israel-



based Accent Software International (800-535-5256) has introduced Accent, a 34-language word processor that lets you use multiple character sets within a single document and switch among different language keyboards.

DELL COMPUTER AND PC RECYCLER

Aurora Electronics are offering a new service that gives your tired PC a new lease on life. Their "asset recovery services" program lets you trade in old PCs (any brand) and receive credit toward Dell purchases. Aurora then recycles the components and refurbishes and resells the PCs to developing regions including China, Russia, and South America. Call Dell at 800-822-2869 or Aurora Electronics at 619-552-1213.—Carol Levin

At the heart of the problem is the wide range of implementations of the PCMCIA specification and the resulting incompatibilities among cards and systems. "As in any free-market enterprise, people say they can [implement PCMCIA] better," explains Jack Peterson of SCM Microsystems, maker of PCMCIA reader/writer systems. "PCMCIA is such a new technology that now is the time to get it right. It is not the time to innovate because users will quit buying PCMCIA."

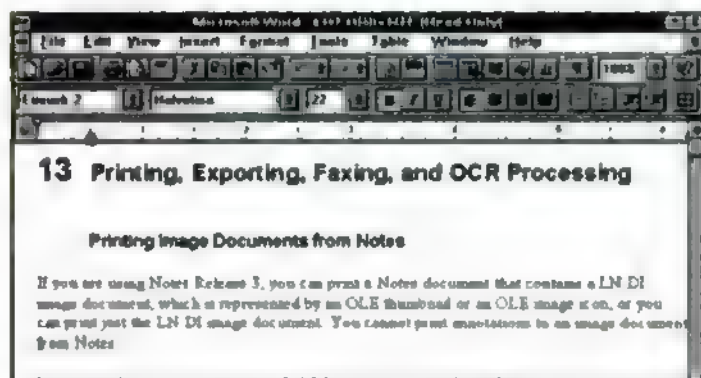
Meanwhile, an increasing number of desktop PCs and notebooks come installed with PCMCIA sockets, and more than 250

cards are on the market. Microsoft has licensed SystemSoft's PCMCIA software for Chicago, and both IBM and Intel have PCMCIA compatibility testing programs in place. According to Brendan McGuire, director of the Personal Computer Memory Card International Association, there's a possibility that the association's standards group could set up compliance testing.

PCMCIA technology is also moving forward. This fall, the association will decide on details of PC Card 32, a major revision of the standard, that may include support for a 32-bit bus interface, multifunction cards, and power management.—Carol Levin

Tongue-Tied over PC Translations?

INSTANT LANGUAGE TRANSLATION is one skill the PC may never master. That's because the PC's logic isn't too swift at handling ambiguity: A skilled human copy editor will outperform any grammar-checking program, handwriting-recognition software is imprecise at best, and digital translators get



easily tongue-tied in grammatical nuances and jargon.

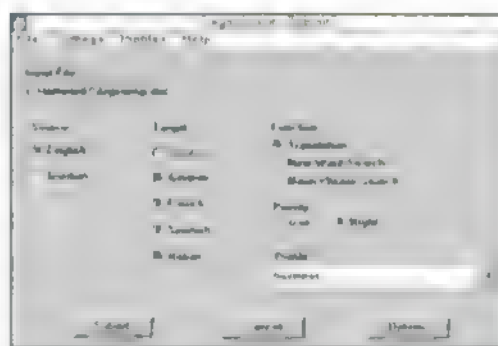
The technology driving computer-based language translation, known as *machine translation*, is moving at a snail's pace because it's a gargantuan computational task that borders on artificial intelligence. "It's not a technical problem, it's a knowledge problem," says Catherine Ball, head of the computational linguistics program at Georgetown University. "Natural language processing requires huge amounts of knowledge."

It's also a big challenge. At the high end, IBM has taken a *statistical* approach in which the translation system builds itself. IBM's program takes parallel text in two languages, aligns the translation with the source, and automatically constructs a translation system. A multimillion-dollar project at Carnegie-Mellon University has produced a knowledge-based translator that dissects the internal workings of a language. And the European Commission is working

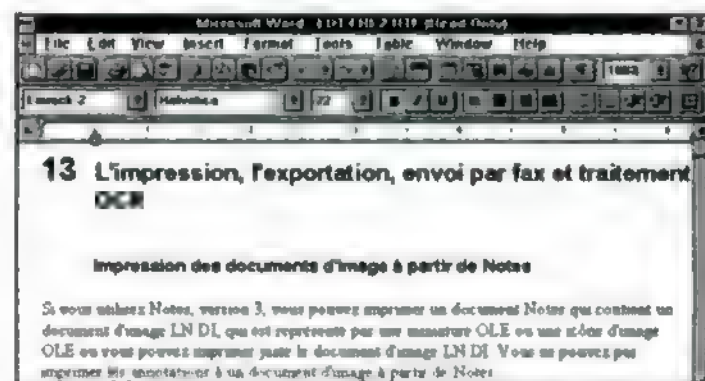
on a translation project to work with all the languages in the European Community.

There's also activity on the PC. Logos Corp., of Mt. Arlington, New Jersey, is developing a PC version of Logos, which now requires up to 300MB of storage and costs between \$25,000 and \$40,000. Fujitsu has a workstation-based translator and recently introduced Atlas, a PC-based translator. And Globalink, of Fairfax, Virginia, is working on porting its translation engine used in Power Translator to an API that can be embedded into word processors and other apps.

Despite these developments, you should eye PC-based translation software with skepticism, advises John Freivalds of Polyglot



International, a language-management firm in Minneapolis. Full-fledged translators attempt to analyze words in context, a more difficult task than word-by-word translation. And everyone agrees that com-



In the Logos system, a Windows-based client can send an English document to a Sun SPARCstation server where the software translates it into French, German, Italian, or Spanish.

puters are not likely to replace human translators at the United Nations at any time in the near future.—Carol Levin and Megumi Jinno in Tokyo

Go Monomaniacal Over ZEOS Notebooks.

ZEOS gives you portable power at a price you'll be crazy about.

We offer you two monochrome choices—an ultra-light subnotebook or a flexible notebook.



Weighing in at 3.9 pounds, the ZEOS Contenda is a lightweight subnotebook that functions like a world-class heavyweight con-

tender. We give you features that pack a punch such as RAM expandable to 10MB, 80 or 120MB hard drives, and the 486 includes PI local bus for super-fast video acceleration. All this in a diminutive

package that's ideal for travel.

The ZEOS Freestyle gives you the power of movement. Our unique tilt and swivel display allows you to share data or keep it private. We give you the option. There's more. For power and speed, we give you a 486SL Intel microprocessor—with a built-in math coprocessor—running at 33MHz. It's the flexible choice that moves with you.

ZEOS has everything you ever wanted in a notebook at prices you won't believe. It's the answer to your anywhere, anytime computing needs. Call a ZEOS Systems Consultant at 800-554-7172.

Contenda	Package 1		Package 2		Package 3	
	386SL-25	\$995	386SL-25	\$1295	386SL-25	\$1595
	486SL-25	\$1195	486SL-25	\$1495	486SL-25	\$1795
	 ▶ 9.7" x 6.1"; 3.9 lbs. ▶ Intel 25MHz 386SL or 486SL CPU ▶ 4MB RAM ▶ 80MB IDE hard drive ▶ 640 x 480 backlit 7.4" display ▶ 256K (386SL) or 512K (486SL) video RAM ▶ NiMH battery & AC adapter ▶ 80-key keyboard, built-in trackball ▶ Serial, parallel, external VGA video port		▶ 9.7" x 6.1"; 3.9 lbs. ▶ Intel 25MHz 386SL or 486SL CPU ▶ 4MB RAM ▶ 80MB IDE hard drive ▶ External 3.5" 1.44MB floppy drive ▶ 640 x 480 backlit 7.4" display ▶ 256K (386SL) or 512K (486SL) video RAM ▶ NiMH battery & AC adapter ▶ 80-key keyboard, built-in trackball ▶ Serial, parallel, external VGA video port ▶ MS-DOS 6.2, Windows for Workgroups 3.11, Lotus Organizer		▶ 9.7" x 6.1"; 3.9 lbs. ▶ Intel 25MHz 386SL or 486SL CPU ▶ 4MB RAM (386SL); 8MB RAM (486SL) ▶ 80MB IDE hard drive (386SL); 120MB IDE hard drive (486SL) ▶ External 3.5" 1.44MB floppy drive ▶ 640 x 480 backlit 7.4" display ▶ 256K (386SL) or 512K (486SL) video RAM ▶ Custom carrying case ▶ Internal fax modem ▶ NiMH battery, extra battery & AC adapter ▶ 80-key keyboard, built-in trackball ▶ Serial, parallel, external VGA video port ▶ MS-DOS 6.2, Windows for Workgroups 3.11, Lotus Organizer	

Freestyle	Package 1		Package 2		Package 3	
	486SL-33	\$1495	486SL-33	\$1795	486SL-33	\$2195
	▶ 8.5" x 11.3" x 1.75" to 2.25"; 5.6 lbs. ▶ Intel 33MHz 486SL CPU, 8K internal cache ▶ 4MB RAM ▶ 120MB IDE hard drive ▶ Internal 3.5" 1.44MB floppy drive ▶ 640 x 480 backlit 9.4" display ▶ 512K video RAM ▶ NiCad battery & AC adapter ▶ 81-key keyboard, built-in mouse key ▶ Serial, parallel, VGA, keyboard ports ▶ MS-DOS 6.2		▶ 8.5" x 11.3" x 1.75" to 2.25"; 5.6 lbs. ▶ Intel 33MHz 486SL CPU, 8K internal cache ▶ 4MB RAM ▶ 180MB IDE hard drive ▶ Internal 3.5" 1.44MB floppy drive ▶ 640 x 480 backlit 9.4" display ▶ 512K video RAM ▶ NiCad battery & AC adapter ▶ Custom carrying case ▶ 81-key keyboard, built-in mouse key ▶ Serial, parallel, VGA, keyboard ports ▶ MS-DOS 6.2, Windows for Workgroups 3.11		▶ 8.5" x 11.3" x 1.75" to 2.25"; 5.6 lbs. ▶ Intel 33MHz 486SL CPU, 8K internal cache ▶ 8MB RAM ▶ 260MB IDE hard drive ▶ Internal 3.5" 1.44MB floppy drive ▶ 640 x 480 backlit 9.4" display ▶ 512K video RAM ▶ Internal 96/24 bps send/receive fax modem ▶ NiCad battery, extra battery & AC adapter ▶ External charging stand ▶ Custom carrying case ▶ 81-key keyboard, built-in mouse key ▶ Serial, parallel, VGA, keyboard ports ▶ MS-DOS 6.2, Windows for Workgroups 3.11	

Fax Orders: 800-362-1205 or 612-362-1205. Phone Orders: Government: 800-245-2449, Outside U.S. and Canada: 612-362-1212. Purchase Orders, MasterCard, VISA, Am Ex, Discover, COD and affordable leasing programs.

800-554-7172
24 Hours a Day • 365 Days a Year



Purchase orders are subject to approval. Business leasing programs available. All prices, specifications and availability are subject to change without notice; call to confirm these and warranty details. Prices do not include shipping. All products and company names are trademarks or registered trademarks of their respective holders. Intel Inside logo is a registered trademark of Intel Corporation. ZEOS and Contenda are registered trademarks. Computer Now! is a registered service mark. Freestyle is a trademark of ZEOS International Ltd. © 1994 ZEOS International Ltd., 1301 Industrial Blvd., Minneapolis, MN 55413 USA. ZEOS is a publicly traded company (NASDAQ symbol: ZEOS). PSSH-PCM-9409B

CIRCLE 063 ON READER SERVICE CARD



The New Sound Blaster AWE32.™



Introducing the wave of the future: the new Sound Blaster AWE32. It combines advanced wave table synthesis, a powerful digital signal processor, and the hottest audio effects all on the same sound card.

That's why it's the next generation PC sound standard.

The Sound Blaster AWE32 puts the world's purest music synthesis technology (from E-mu Systems) inside your

PC. It also includes effects like chorus and reverb for increased depth and richness. And QSound so you can position sounds in 3D.

It even comes with downloadable SoundFont™ technology, so you can add to the library of sampled sound effects and

SOUND BLASTER AWE32 INCLUDES:

SOUND BLASTER AWE32
TRUE 16-BIT CD SOUND
ADVANCED WAVEEFFECTS™
SYNTHESIS
32-VOICE POLYPHONY
SAMPLING SUBSYSTEM

GENERAL MIDI INTERFACE
THREE CD-ROM INTERFACES
MICROPHONE
SOFTWARE INCLUDES:
CAKEWALK APPRENTICE FOR
WINDOWS

HSC INTERACTIVE SE
CREATIVE WAVESTUDIO™ 2.0
QSOUND CONTROL PANEL
CREATIVE ENSEMBLE™
CREATIVE SOUNDO'LE™
CREATIVE MOSAIC



ADVANCED WAVE TABLE BY SOUND BLASTER. ACCEPT NO IMITATIONS.



instruments. For power users, it offers the latest speech technology. So you can navigate through all the major Windows™

applications using voice commands.

Of course, it's a Sound Blaster. So it makes all your favorite games and software sound more outrageous than you ever imagined. All this sound technology could cost you thou-

sands. But the new Sound Blaster AWE32 is only \$399.* No other sound card comes close. Sound interesting? Visit your local Creative Labs dealer. Or call 1-800-998-5227.

CREATIVE
CREATIVE LABS, INC.

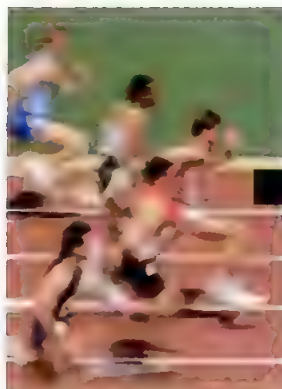
WAKE UP THE REST OF YOUR BRAIN.™

© 1997 Creative Technology Ltd. All other trademarks are the property of their respective owners. U.S. inquiries: Creative Labs 1-800-998-5227 or 408-428-6600. International inquiries: Creative Technology Ltd., Singapore TEL 65 773 0233 FAX 65 773 0353

CIRCLE 086 ON READER SERVICE CARD



A WINNER IN EVERY EVENT.



PERFORMANCE

Decathlon can run with the best of them. With a choice of Fast SCSI-2 or Fast ATA-2 interfaces, you get up to 16.6 MB/second in data throughput performance. Along with its quick 12 millisecond average seek and 4,500 rpm spindle speed, the Decathlon provides you the capability to keep pace with even the most demanding applications—including advanced multimedia.



Decathlon's the drive that helps you clear all kinds of hurdles.

It not only meets the Energy Star requirements for today's green PCs, but also features low 26 dBA acoustics for whisper quiet operation.

POWER



CAPACITY

So how high does it go? Decathlon packs 545 MB in its compact configuration. And with a two-year warranty and 40,000 contact start-stop cycle reliability, you can be sure this drive is a reliable winner.



If your new system calls for the kind of efficient drive that excels in every area, Decathlon is it.

Call Seagate at 408-438-8111 for more information.

 **Seagate**
THE DATA TECHNOLOGY COMPANY

First Looks

HANDS-ON REVIEWS OF NEW SHIPPING PRODUCTS

■ Spreadsheets

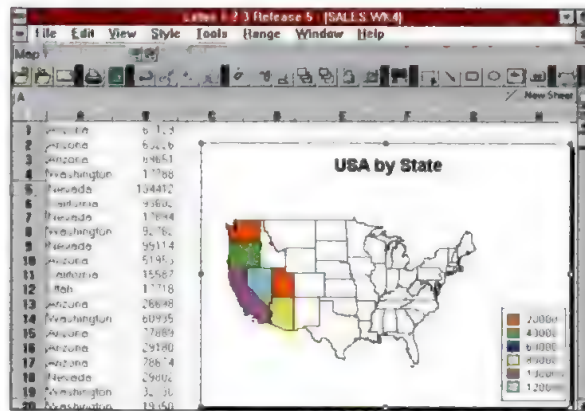
Lotus Maps Out the Future of Spreadsheets with 1-2-3

BY CRAIG STINSON

In the high-stakes game of features leapfrog played by spreadsheet vendors Lotus, Microsoft, and Novell, inventing a new analytic wrinkle can constitute a major coup. Lotus adds a new dimension to spreadsheet work by integrating maps into the \$495 Lotus 1-2-3 for Windows, Release 5.0. And that's only the start: 1-2-3 now has database connections and better network support, as well as other helpful ways to speed spreadsheet work.

Slipping a geographic per-

spective into your spreadsheet with 1-2-3 starts with including a column of place identifiers (such as states) in the spreadsheet, followed by one or more columns of numeric data—sales figures, for example. The program will then draw a color-coded map showing where the numbers are highest and lowest and showing various points inbetween (see the sidebar "Mapping the Easy Way").



MAP: By adding maps and geographic references, 1-2-3 can zoom in on information and connections like no other spreadsheet program.

The idea isn't original, but it yields powerful results. Add-in

vendor Software Illustrated (510-463-9898) has been supplying mapping functionality for Quattro Pro for Windows and Microsoft Excel for more than a year. But Lotus is the first spreadsheet maker to build this form of analysis directly into the

program from the ground up, and the company includes it at no extra charge. Included are maps of the world by country, of the United States by state, of Canada by province, and of the European Union by region. Additional maps are available from Strategic Mapping, Lotus's third-party supplier.

Maps are the biggest attention-getter in this release of 1-2-3. But there are *Continues on page 38*

► IN FIRST LOOKS

TEAC SuperQuad 4X AT CD-ROM Drive	40
TelevEyes/Plus	40
Aldus FreeHand 4.0 for Windows	42
Lotus Forms 1.0	44
IBM PCMCIA 16-Bit PCMCIA Audio, MediaMagic PCMCIA Notebook Sound Card, New Media	
.WAVjammer, I/O Magic	
Tempo	46
UMAX Maxmedia CX/24 Graphics Accelerator Card	47
WinEst 2.1	48
DocuComp for Windows, Version 3.0	48
ComScan	48
Telemorph for Windows, Version 3.0	50
WordPerfect Envoy 1.0	50
PhotoGenix	52
Power Utility Pak	52
SmarText, Release 3	54
VoiceLock 1.04	56
QAPLUS/WIN 6.0	56

■ Windows Software

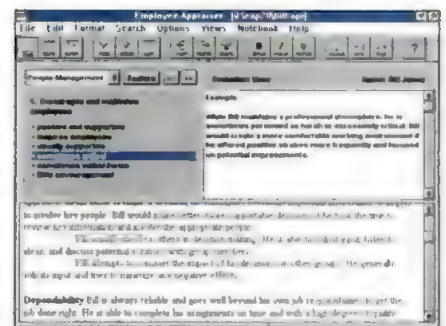
Employee Evaluation Software Creates Thorough, Uniform Reviews

BY KATHY YAKAL

Suggest the idea of automating employee performance reviews to human resources professionals and you're likely to get a less-than-enthusiastic response. But managers who have toiled over filling out annual employee reviews would likely respond that there must be a better way. There is. Three new software products from Austin-Hayne Corp., Avantos Performance Systems, and KnowledgePoint give you tools to streamline this uncomfortable and time-con-

suming chore to produce more thorough and consistent performance reviews.

Developed in conjunction with legal and human resources professionals, these packages offer advice for the manager and tools for maintaining ongoing evaluations. Password protection is built in, and each product can proof reviews for spelling and inappropriate language.



RATE: Employee Appraiser has text nuggets describing various levels of competence.

Continues on page 39

Lotus 1-2-3

CONTINUED FROM PAGE 37

plenty of other important improvements, particularly in the areas of everyday usability, workgroup support, and database management. Lotus has

now adapted the notion of style templates and wizards for creating commonplace functions by incorporating eleven attractively designed and functional SmartMaster templates into 1-2-3. These facilitate a variety of tasks, from creating budgets and amortization

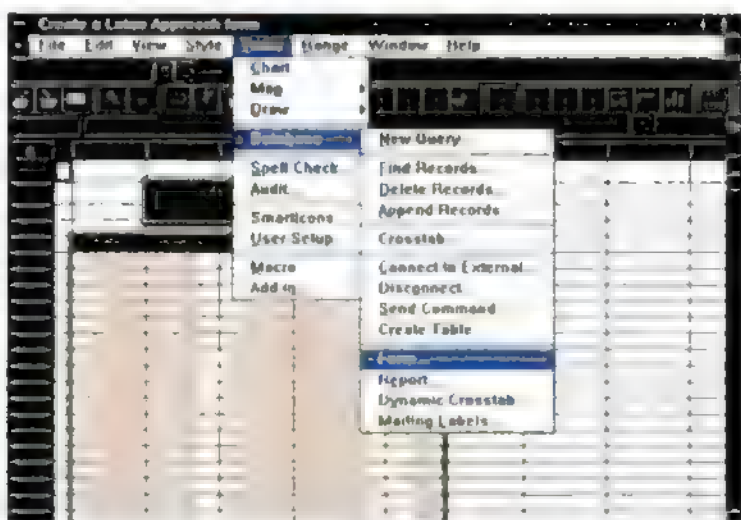
schedules to filling out time and expense reports, creating invoices, and analyzing competitive products. The SmartMasters exemplify a new file type, called .WT4; templates can be created simply by saving in this format.

It's easy to use the included templates, design your own, or both. To help you produce your own templates, Lotus supplies a SmartMaster skeleton, a fill-in-the-blank tool for creating templates that look and function like the ones that come in the box.

In several ways, the new 1-2-3 is a more mouse-worthy spreadsheet than Release 4.0. You can now drag the lower-right-hand corner of a cell or range to replicate formulas or create standard label sequences, and you can use the mouse to move and copy ranges across worksheet or file boundaries. Rest your cursor on a SmartIcon and the icon's description pops up in a large yellow bubble.

The Page Setup command

now offers horizontal and vertical centering, and the print previewer displays multiple pages and adjusts its display to the color capabilities of your printer. But you still can't adjust margins, column widths, or page breaks from within the viewer.



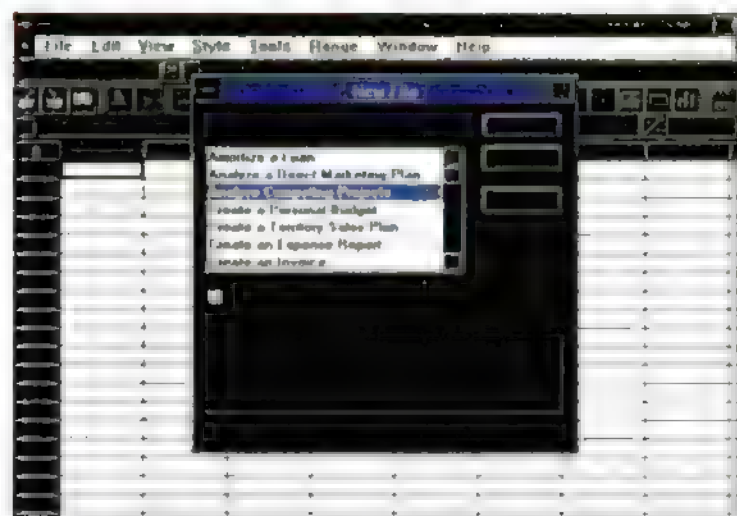
DATA-APPROACH: 1-2-3's integration with any Approach database allows for easy and intuitive queries.

On the workgroup front, Release 5.0 offers improved Notes F/X performance; a Doc Info dialog is included for tracking who did what to your worksheet when. There are

fields for author, keywords, comments, most recent editor, most recent edit date and time, total editing time, and more. This information is made available to Notes databases via Notes F/X. 1-2-3 still can't find documents on the basis of their Doc Info field contents, but it can perform range routing, which enables you to send all or some of a worksheet to a set of MAPI or VIM e-mail recipients, either sequentially or simultaneously.

To expedite database management, 1-2-3 now imports

dBASE and Paradox files directly, bypassing Translate. A more extensive new set of database features comes to 1-2-3 via the simultaneously shipped Lotus Approach for Windows, Release 3.0. With Approach loaded, 1-2-3 adds four com-



INSTA-FUNCTION: SmartMasters in 1-2-3 help with preformatted functions for popular tasks like filling out expense reports.

mands to the database menu: Form, Report, Dynamic Crosstab, and Mailing Labels. When you invoke any of these, 1-2-3 funnels your data into the appropriate Approach module.

Integration between the two modules is good but well short of perfect. The OLE 1.0 hookup to Approach violates 1-2-3's principle of in-site editing; the Approach features can't be applied directly to a 1-2-3 query's result set; and long 1-2-3 text fields will overflow Approach's 256-character limit. And unlike Excel's PivotTable Wizard, Approach's Crosstab Assistant does not group field items or perform internal calculations. To do these things, you'll need to preprocess your 1-2-3 data or call on other components of Approach. Nevertheless, with

Approach in the wings, 1-2-3 has become a far stronger data analyst.

There are still some wish-list items that Release 5.0 doesn't offer. The program lacks a flexible group-edit mode, doesn't permit independent windowing of worksheet pages, and offers no sim-

ple way to reorganize a set of pages. The enhancements to general usability and workgroup support are important and valuable, however. The Approach connection adds welcome database muscle. And if geographic analysis is germane to your work, this is a must-have upgrade.

► **Lotus 1-2-3, Release 5 for Windows.** List price: \$495; upgrade from earlier versions or competitive products, \$129. Requires: 4MB RAM (6MB for mapping features or integration with Lotus Approach), 11MB hard disk space, Microsoft Windows 3.x. Lotus Development Corp., 55 Cambridge Pkwy., Cambridge, MA 02142. 800-343-5414, 617-577-8500.

Circle 430 on reader service card



From September 19 through September 23, you can go on-line to download a demo of Lotus 1-2-3, Release 5 for Windows or to discuss the program with Craig Stinson and Lotus product manager Paul Stroube. Type GO ZNT.EXEC from any CompuServe!

Mapping the Easy Way

To create a map in 1-2-3, start by selecting at least two columns of data—a column of geographic identifiers and a column of numbers. Lotus 1-2-3 performs a frequency-distribution analysis of your data, finds appropriate distribution bins, and generates a color-coded map. If you select a third column of data, 1-2-3 adds a second frequency distribution, using hatch patterns instead of colors to depict the second variable. With additional columns, you may add pins to particular map coordinates—to show the home office of each regional sales rep, for example.

Placing pins requires that you know exact latitudes and longitudes. You can find these by double-clicking the embedded map to summon the Map Viewer. Here you may also perform rudimentary editing on the embedded map. For more extensive editing—to remove the blank states in the figure, for example—you'll need 1-2-3's own drawing tools or another editing program.—CS

Evaluation Software

CONTINUED FROM PAGE 37

REVIEW WRITER

The \$129 Avantos Review Writer from Avantos Performance Systems, offers a clear guide to help you through the evaluation process. It's the most efficient of the three products we reviewed.

Review Writer's QuickBuild feature maps out the seven steps required to complete a review, and takes you to each with the click of the mouse. For example, "Define form and content of review" takes you to a graphic of a file folder; you click on each successive tab to select a template (eight are supplied).

Two sets of data are reviewed during the actual evaluation: goals and performance categories. Weights can be assigned to both, and you can use one of several predefined rating scales or build your own. You rate each performance category and subtopic by putting a check mark in the appropriate place on the scale; Review Writer displays the matching text, which you can edit and rearrange on the review. Like the other products reviewed here, Review Writer offers individual suggestions for improvement, though it provides a wider range of responses.

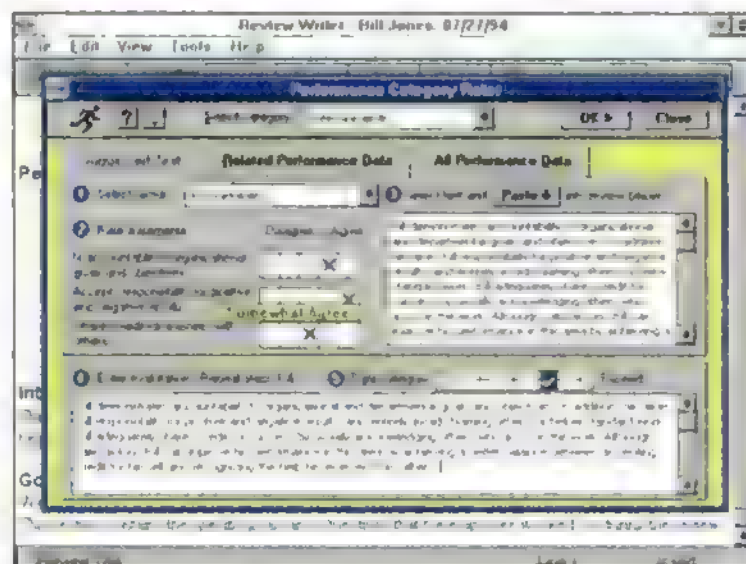
The AdvisorScan function is the most thorough audit process offered by any of these products. LegalCheck flags inappropriate, discriminatory, or overly vague wording, and it did so far more efficiently on our tests than the other products. SpellCheck scans for spelling errors, and Quality Check monitors the review's completeness and originality, something the other two products don't.

EMPLOYEE APPRAISER 2.0

The \$129 Employee Appraiser, Version 2.0, from Austin-Hayne Corp., combines its writing-by-example approach to performance reviews with on-line management advice, as well as

providing tools to help managers track their employees' progress on a daily basis. The product offers a generous palette of evaluation criteria and fine-tuning features, though it falls short in areas such as customizability, user guidance, and after-the-fact auditing.

Employee Appraiser in-



FILL: Review Writer translates your rankings into text that you can move directly to the evaluation form.

cludes one sample review template, but you can design your own by choosing from among 21 generic evaluation topics. As each topic comes up for evaluation, you rank employees on several subtopics.

For example, under "Communicates ideas in writing," appears "Writes clearly" to "Writes unclearly," with several shades in between. Click on one, and up pops a brief paragraph describing that ranking. To fine-tune even further, clicking on the

Positive and Negative icons adjusts the rating slightly. If nothing matches the employee exactly, you can write your own description or edit the existing one after you've clicked on the Place Example icon, located within the review form.

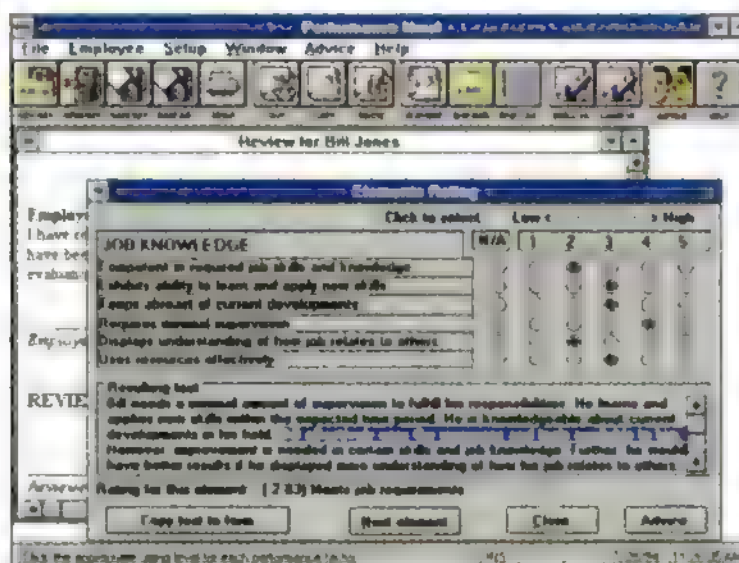
Employee Appraiser is useful year-round, not only at review time. The Coaching Advisor offers hundreds of tips, which are written to match the

program's evaluation topics, to help both managers and employees improve their performance; you can jot ideas and thoughts in the Manager's Notebook. Notes can be transferred directly into a review form at evaluation time. Spelling Check and Language Scan proof your work for misspellings and inappropriate language.

This is an important executive safety net: In our testing, the Employee Appraiser program picked up many words that imply a value judgment, for instance "defensive," "dumb," and "emotional problem." The Scan Glossary can be edited and augmented by the user.

PERFORMANCE NOW!

The \$169 Performance Now! from KnowledgePoint is a bit more expensive than the other two products, but some users



TRACK: Performance Now! keeps a running tally of your employees' ratings.

may find the extra cost worthwhile because of the product's thoroughness.

Performance Now!'s core features are similar to those of Employee Appraiser: You select performance elements, ranking them on a scale of one to five. As you choose the ratings, sample sentences automatically rearrange themselves so that positive and negative attributes are grouped together with connect-

ing conjunctions. The program's Employee Log allows you to paste appropriate notes into the form.

The program's employee information form is more thorough than those used by the other two products and allows for four additional user-defined fields. The evaluation section responds more interactively to the user; if you give someone both high and low marks in one subtopic, or too many high or low marks, a warning flag suggests that you reconsider or provide concrete examples. If you use KnowledgePoint's Descriptions Now program to write job descriptions, this data can be imported to speed the evaluation process.

Despite their individual differences, these three products present a common core of features. Used conscientiously, performance review software can enhance evaluations, because the information is gathered on a year-round basis, rather than forcing the manager to rack her brain for lost details the day before the review is due.

► **Employee Appraiser 2.0.** List price: \$129. Requires: 2MB RAM, 2MB hard disk space, Microsoft Windows 3.x. Austin-Hayne Corporation, Three Lagoon Dr., #340, Redwood City, CA 94065; 800-809-9920, 415-610-6800; fax, 415-610-6810.

Circle 427 on reader service card

► **Performance Now!.** List price: \$169. Requires: 4MB RAM, 8.5MB hard disk space, Microsoft Windows 3.1 or later. KnowledgePoint, 1129 Industrial Ave., Petaluma, CA 94952; 800-727-1133, 707-762-0333; fax, 707-762-0802.

Circle 428 on reader service card

► **Avantos Review Writer.** List price: \$129. Requires: 4MB RAM, 9MB hard disk space, Microsoft Windows 3.x. Avantos Performance Systems, Inc., 5900 Hollis St., Emeryville, CA 94608; 800-282-6867, 510-654-4600; fax, 510-654-1725.

Circle 429 on reader service card

■ CD-ROM Drive

TEAC SuperQuad 4X: Quadruple-Speed, Low-Cost CD-ROM Drive

BY MICHAEL J. ZULICH

The new quadruple-speed CD-ROM drive from TEAC America, the \$649 SuperQuad 4X AT CD-ROM Drive, delivers high data throughput at a low cost. This drive will be available for about \$430 on the street, making it one of the first quadruple-speed (600-kilobyte-per-second) drives under \$500.

The SuperQuad 4X comes packaged with a proprietary 8-bit IDE interface card, an audio CD-player program, and both DOS and Microsoft Windows drivers. The audio CD-player program is done well, using the familiar radio-button controls and digital readouts.

Installation with the interface card was a breeze, as the TEAC software provides a wide selection of port addresses from 000h to 3FCh. The interface card even includes left- and right-channel audio-output connectors, allowing you to connect powered speakers easily to the drive. In addition, the drive can be connected to sound boards compatible with the Creative Labs Sound Blaster, freeing up an expansion slot.

SPEED ISN'T EVERYTHING

Performance on PC Labs' CD-ROM benchmark tests was, however, somewhat disappointing. The SuperQuad 4X proved to have excellent throughput—but when it came to playing video, we found the drive lacking.

We tested the SuperQuad 4X on a Compaq 486DX/33 with 8MB of RAM, Version 2.33 of the Microsoft MS-DOS CD-ROM Extensions driver, and an ATI Graphics Ultra Pro equipped with 2MB of VRAM. The TEAC drive turned in an excellent data-transfer rate of 605 Kbps on the telltale 16K

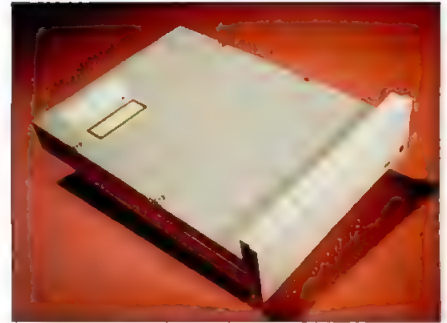
Block Sequential Read test. Unfortunately, that's where the drive stopped impressing us.

Under the Microsoft VidTest CD-ROM tests, the SuperQuad 4X dropped 336 out of 930 frames while playing back a 16-bit-color, 15-frame-per-second, Intel Indeo-based .AVI file. This performance is somewhat lackluster when compared with the drive's competition, as is the SuperQuad 4X's rather small on-board buffer (64K).

Regardless of these shortcomings, the TEAC SuperQuad 4X

is still a good buy for a quadruple-speed drive that supports CD-ROM XA, Kodak multisession Photo CD, and is MPC II compliant. At less than \$500 on the street, the SuperQuad 4X has broken the price barrier for high-speed CD-ROM drives. If you are looking for quadruple-speed throughput at a reasonable price, then this may be the drive for you.

► **TEAC SuperQuad 4X AT CD-ROM Drive.** List price:



SUPERQUAD 4X: TEAC's newest drive quadruples CD-ROM speed.

With TEAC AT interface board, \$649. TEAC America Inc., Data Storage Products Division, 7733 Telegraph Rd., Montebello, CA 90640; 800-888-4923, 213-726-0303; fax, 213-727-7672.

Circle 437 on reader service card

■ Video

TelevEyes/Plus Lets You See VGA in NTSC

BY MITT JONES

Products that let you connect your PC to a television and record what appears on-screen have long been available, but the \$449.95 TelevEyes/Plus from Digital Vision adds a new twist. This very portable unit has a built-in 3-watt preamp, volume control, and jacks for both microphone and preamplified audio input; it can also double as a low-power PA system or as a pass-through for adding audio to recordings.

TelevEyes/Plus provides a few features not often found with other scan converters in its price range, including capable hardware flicker filters, hardware support for 640-by-480 resolution through 24-bit color depth, and hardware support for simultaneous use of a standard VGA monitor and a National Television Standards Committee (NTSC) device, such as a television or VCR. Video jacks include standard 15-pin VGA input/output connectors and, for composite (NTSC) out-

put, RCA phono and S-video connectors. Given the product's relatively low price, it's not surprising that it omits gen-locking capability, a must if you want to overlay titles and other comput-



TELEVES: Use a TV for presentations with this VGA-to-NTSC converter.

er graphics onto business videos.

Measuring just 1.2 by 7.0 by 4.0 inches and weighing only 1.4 pounds with its AC adapter and video cables, TelevEyes/Plus would seem a great solution for taking large-screen presentations on the road. Unfortunately, both Digital Vision's

DOS TSR and Microsoft Windows image-control software clashed with the special font driver and Windows-based power-management utilities of the Toshiba T1900 laptop used for testing.

Because the NTSC standard calls for two 30-Hz interlaced signals, you'll have to set your graphics adapter to operate at a refresh rate of 60 Hz if you want to use TelevEyes/Plus with Windows. NTSC output within Windows was fairly impressive, though the image showed notable distortion in places and extended off the edges of the screen in each direction.

If you need exceptional NTSC output for producing professional-quality videotapes and presentations, then you should look elsewhere. But for 449.95, TelevEyes Plus should prove a handy and relatively inexpensive tool for generating

NTSC output for simple presentations that don't have to be perfect.

► **TelevEyes/Plus.** List price: \$449.95. Digital Vision Inc., 270 Bridge St., Dedham, MA 02026; 800-346-0090, 617-329-5400; fax, 617-329-6286.

Circle 438 on reader service card



Announcing OCR that's so accurate, anything else is simply pointless.

Introducing OmniPage Professional 5.0 from Caere, the leader in OCR.

We'd like to make our point perfectly clear.

OmniPage Professional sets the standard in OCR. Offering more accuracy, more power, and more flexibility than ever before.

In fact, it offers the most advanced OCR technologies in the industry—technologies that Caere has pioneered.

Only Professional helps you spend more time using scanned information instead of correcting it. Its breakthrough 3D OCR™ feature recognizes grayscale information during document scanning to greatly improve recognition of poor quality documents.

That's not all. Professional recognizes a broader range of documents, reading the most difficult characters and symbols with ease. A feat made possible thanks to its exclusive Language Analyst™, neural network and fax recognition capabilities.

Professional also scans and saves text and embedded graphics in the original format with its breakthrough True Page™ feature. Plus, it allows you to easily edit both text and graphics with a WYSIWYG Text Editor and 24-bit color image editor.

For maximum ease of use and flexibility, there's even a new click-and-choose interface.

So get OmniPage Professional 5.0 for your PC today. See your local Caere dealer or call for more information on the complete family of OmniPage products at 1-800-535-SCAN. If you own a competitive product, ask about our "Step up to OmniPage" program.

For superior performance, it's your best shot.

omniPAGE
PROFESSIONAL



For Your Information.

Caere and OmniPage are registered trademarks of Caere Corporation. The Caere logo, True Page, and Language Analyst are trademarks of Caere Corporation. All other trademarks are of their respective companies. © 1994. All rights reserved.

CIRCLE 292 ON READER SERVICE CARD

Illustration

FreeHand 4.0: For Serious Artists Only

BY LUISA SIMONE

Aldus FreeHand 4.0 for Windows is a \$595 drawing program designed specifically for professional artists. It sacrifices huge clip-art libraries, automated special effects, and ancillary utilities in favor of cross-platform compatibility, error-free PostScript output, and robust drawing tools.

At first glance, the most notable things about FreeHand are the things it doesn't have. With the exception of a half-dozen tutorial images, it doesn't have any bundled clip art. Nor does it offer special effects such as extrusion or warping. The only bonus is Adobe Type Manager, which is included to help you manage and print the 126 included Type 1 fonts.

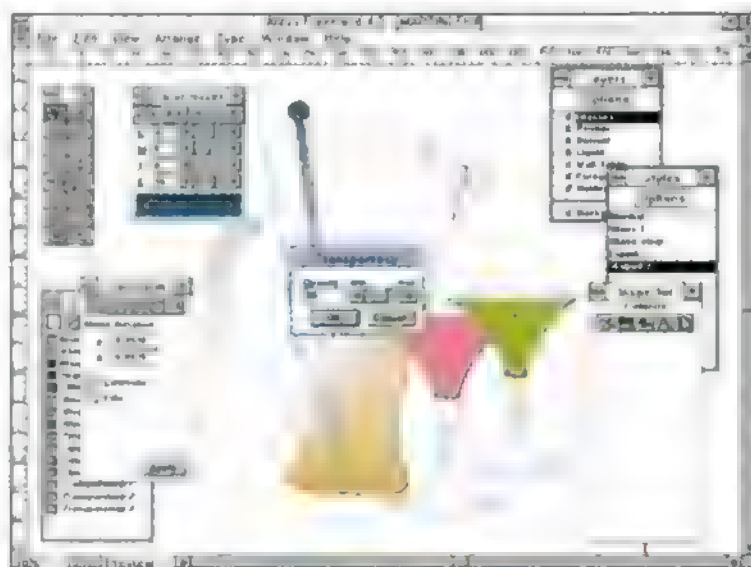
EASY PRINTING

First and foremost, FreeHand is totally compatible with the Macintosh version of the program, so mixed-platform studios can share FreeHand files directly. And most service bureaus, which are predominantly Mac-based, will be able to troubleshoot your Windows files using FreeHand for Macintosh.

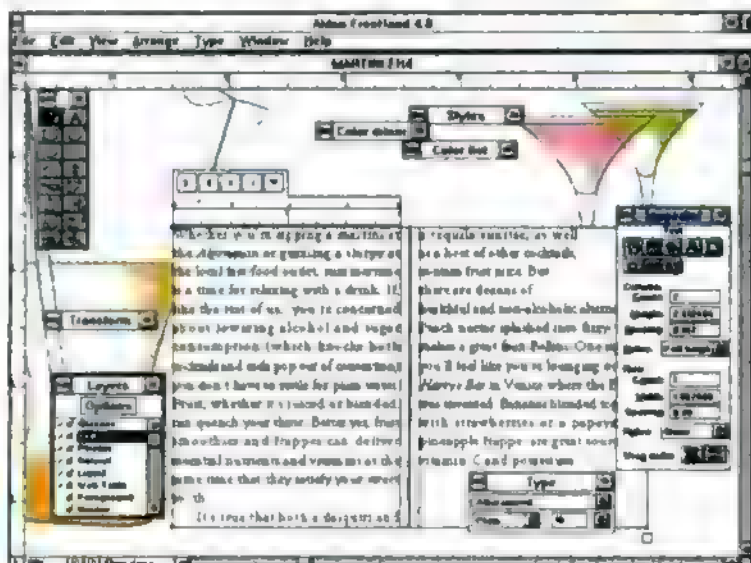
FreeHand guarantees glitch-free PostScript output by never stepping too far away from PostScript's intrinsic capabilities. So where other programs such as CorelDRAW really function as automated special-effects engines, FreeHand remains a 2-D drawing program; perspective must be drawn manually. FreeHand does make the

drawing process easier with several new functions, but this is a powerful program primarily for professional artists.

The most significant additions to this version are the path operators, which can save you from tedious node editing. Joining paths together is down-



STACK: FreeHand can automatically create overlapping objects with the appropriate colors to simulate transparency effects.



FORMAT: The Inspector palette lets you quickly set up multiple columns for a block of text.

right easy with the Union command. And the new Intersect command makes transparency effects automatic. Not only will FreeHand create the overlapping object, it will also fill it with an appropriate color to simulate transparency.

The major weaknesses of previous versions of FreeHand are addressed by adding strong typography and layout functions.

Now you can set up real paragraph styles, complete with tabs and indents. Text frames can contain multiple columns, multiple rows, and automatic rules.

TYPE AND LAYOUT STRENGTHS

In keeping with the spirit of a drawing program rather than a desktop publishing program, FreeHand also offers some unique text functions. You can balance text columns and even enlarge text for copy fitting purposes—all automatically. Although FreeHand boasts a 54-by-54-inch maximum page size and multipage documents, the two

features are mutually exclusive. So you can have multiple pages, and even pages of differing sizes and orientations, but only if they all fit within the single pasteboard.

Many functions that were previously hidden in nested menus and dialog boxes have been brought to the surface of the program in the form of floating palettes. This new interface not only provides much easier access but allows you to work with an intuitive drag-and-drop technique. To assign colors, for example, you simply drag a swatch from the color palette and drop it over your object. The program even senses whether you want to change the line color, fill color, or one of the tints in a gradient.

The Inspector palette is by far the most powerful aspect of the revamped interface. Depending upon the selected object, you can use the Inspector palette to alter colors, change line style, and even insert or delete pages from a document. Technical illustrators will appreciate the new Transform palette, which provides an efficient way to enter numerical data for precise moves, rotations, and resizes.

Of course, FreeHand isn't

perfect. Without true scaled-dimension lines or multiple drawing constraints, FreeHand falls short in the technical illustration category. In addition, text wrap attributes can't be assigned to grouped objects, although subselected individual objects within a group work well. Exporting TIFF files also yielded some unexpected results because FreeHand exports all objects on the entire pasteboard whether you want it to or not; you must temporarily delete all of the objects you don't want exported prior to saving.

More problematic were the color shifts that occurred when exporting 8-bit versus 24-bit TIFF images. And though the OLE 1.0 support keeps FreeHand in sync with PageMaker 5.0, support of OLE 2.0 would be better.

The news about FreeHand doesn't stop with Version 4.0. Aldus, the longtime distributor of FreeHand, is merging with Adobe. As part of a settlement, distribution of FreeHand will revert to AltSys (the program's developer) before next July. FreeHand users concerned about the long-term stability of the product should be reassured. AltSys Corp., best known for its Fontographer program, is committed to FreeHand's future and will continue to develop and market the program.

There is no doubt that Aldus FreeHand achieves the goal of providing elegant two-dimensional drawing functions and sophisticated text-formatting tools within the context of a streamlined interface. Whether those goals coincide with the objectives of the Windows-based drawing market remains to be seen.

► **Aldus FreeHand 4.0 for Windows.** List price: \$595, upgrade \$150. Requires: 8MB RAM (12MB recommended), 6MB hard disk space, Microsoft Windows 3.1 or later. Aldus Corp., 411 First Ave., South Seattle, WA 98104; 800-628-2320, 206-622-2320; fax, 206-343-3360.

Circle 431 on reader service card

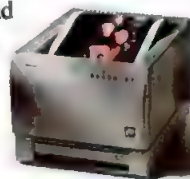


Tektronix

Color is color, unless you want colorful overheads.

Then you need Phaser Color. Because only the Phaser™220 Color Printer gets everyone's attention with stunning color overheads using SuperCell 600™ resolution. Brace yourself for colorful language. Your text and graphics stand up and shout, even on plain laser paper. And it's fast. The Phaser 220 processes images at RISC-speed and prints a color page in 30 seconds. It supports PCs, Macs, workstations and

networks simultaneously with true Level 2 Adobe® PostScript™ and Pantone® Color matching. It's dual capacity tray switches media on command from your desktop. And it's from Tektronix, the Fortune 500 leader, where quality in workgroup color printers starts at only \$2,995 and doesn't end until you hear the applause.



Forms

Lotus Forms Fills in the Blanks

BY GREGG KEIZER

In the battle against the demons of paper, an electronic-forms creator and distributor can be a sharp sword. Rather than fill out, forward, and file the real thing, these programs build and then route standardized electronic documents over a network. With its \$395 Lotus Forms 1.0, Lotus Development Corp. presents a durable and easy-to-use basic blade that excels at moving documents among heterogeneous mail systems. Still, Lotus Forms could stand a bit of honing, for it lacks some of the forms-creation tools and platform variety that its competitors already provide.

Like most other electronic-forms software, Lotus Forms consists of distinct components: A Designer is used to build the necessary forms, and a Filler actually completes the form. The basic package includes one copy of the former and a license for five of the latter. Additional Fillers are \$149 each.

FILL OUT...

Lotus Forms' Designer combines an easy-to-use interface and rich toolset with considerable scripting power at the high end. Designer, which relies to a large extent on Lotus's now-familiar SmartIcons, also features tabbed pages, which segregate the primary chores of designing the form, setting its routing, modifying its menus, and adding advanced and customized capabilities through scripting. To build a form, you can select from menus or drag and drop objects from a SmartIcon palette into place.

Modifying those objects is just as easy. A double-click of the mouse brings up a small and well-organized dialog box, where more tabs take you to each category of the object's

properties, such as its style and format. At any time in the process you can switch to a Filler view, which reproduces what the end user will see.

While many forms can be created without resorting to the included LotusScript 2.0 scripting language, developers can use it to add such things as calculations, DDE calls, and advanced routing logic to forms. For those on the other end of the expertise spectrum, Lotus bundles a dozen form templates—including expense, phone-message, and purchase-order forms. Seventeen more templates, ranging from accounts-receivable to credit-memo forms, will be available for downloading from CompuServe (GO LOTUS) by fall.

Lotus Forms is well-suited for drawing information from an existing database, depositing it in a form, and maintaining those connections. Equipped with Open Database Connectivity (ODBC) drivers for dBASE, FoxPro, Lotus Notes, Lotus Notes SQL, Microsoft Access, Microsoft SQL Server, Paradox, and Text, Lotus Forms lets designers create fields within a form and then link them to a database.

SEND TO...

One of Lotus Forms' strengths is its ability to route a form regardless of the method used to route it. A form's path and final destination requires establishing a series of stops through the organization. You can route a form based on name or role and send a form to multiple stops simultaneously. And with scripting, you can create conditional stops that may, for instance, come into play only when a purchase or-

der exceeds a predetermined amount. This routing logic is embedded within the form, ensuring that the path is always available, no matter what form of transport is used between stops.

The key to Lotus Forms is its ability to route a form over any VIM- or MAPI-compliant e-mail system. You can, for example, route a form so that it moves from a Notes address to a cc:Mail user to a Microsoft Mail mailbox. The VIM-to-MAPI

form-creation process and instead work with Lotus Forms' Filler to complete the form. This application offers some annotation tools—a red pen for mark-ups and a Post It-style note maker—but they are neither as plentiful nor as flexible as the annotation tools found in most fax packages.

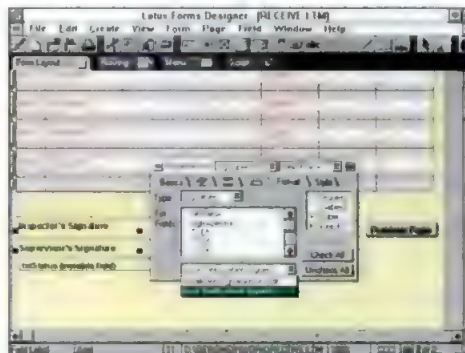
While there is a lot to like about the Lotus Forms package, it lacks several critical elements. Unlike a package such as Delrina FormFlow, Lotus Forms does not allow developers to build a collection of objects that can be shared and reused by any and all forms. You can, however, cut and paste objects from one form to another. And although

Lotus says that it will introduce Fillers for DOS, Macintosh, OS/2, and Unix in the future, its current Filler runs only under Windows—whereas JetForm 4.0, for instance, offers DOS, Macintosh, and Windows Fillers.

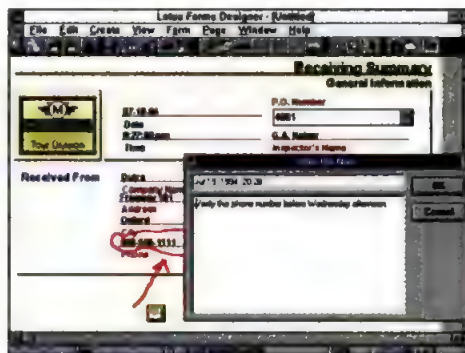
These limitations aside, Lotus Forms makes a good workflow-management addition, particularly for firms already wired through Lotus Notes. It's no surprise that Lotus Forms integrates well with that workgroup application, being able to use it for everything from form transport to database queries. Companies without Lotus Notes, however, shouldn't ignore Lotus Forms; its form design, database connection, and routing expertise are impressive.

► **Lotus Forms 1.0.** List price: \$395 (Designer and five Filler licenses). Requires: Microsoft Windows 3.x, 4MB RAM, 9MB hard disk space for Designer, 5MB for Filler. Lotus Development Corp., 55 Cambridge Pkwy., Cambridge, MA 02142; 800-346-1305, 617-557-8500.

Circle 418 on reader service card



ADAPT: Tabbed dialog boxes make field modification a snap.



MARK-UP: Filler's annotation tools include a red-pen marker and pop-up notes.

DLL, which was in beta form when Lotus Forms was released, worked without a hitch. It was able to route forms over MS Mail reliably. Lotus Forms tracks the progress of the form and can enter information from each stop into a database table or send e-mail notification.

End users see none of this

Primavera Project Planner.[®]

Project management software that's so powerful,

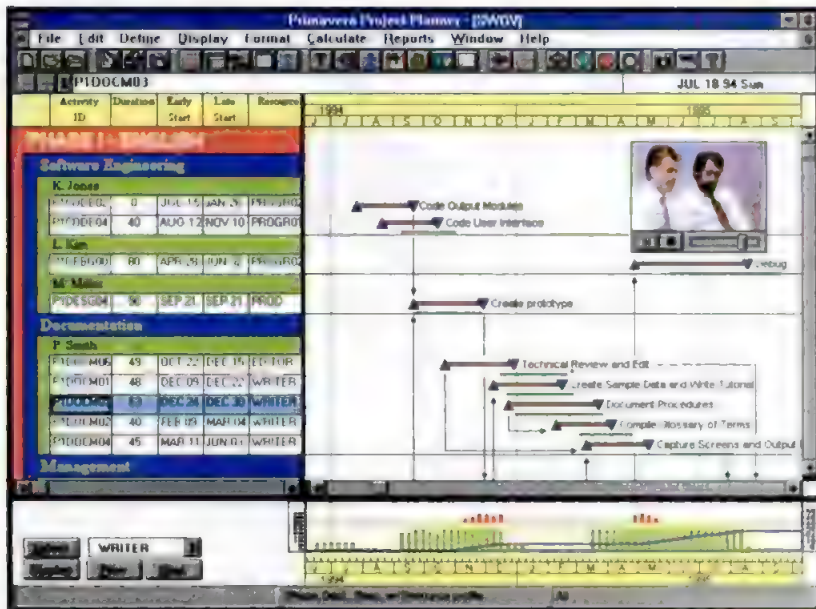
Introducing the power to see everything more clearly. To understand what's happening. And to control every detail of the project. Primavera Project Planner for Windows[™] is powerful new software, capable of handling the toughest projects, especially in a **SO** multiuser, multiple project environment.

so persuasive,

Now you can communicate clearly, dramatically and professionally with information-rich reports and graphics. Primavera makes it easy to get your point across whether you're talking in

so insightful,

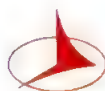
the board room, the lab, the plant or on the job site. Primavera gives you unlimited ways to analyze your project. You can even organize and summarize by resources and WBS. You'll know the who, what, when, why and how much—and keep your project under control.



Primavera Project Planner gives you unlimited ways to organize and format project information for better on-screen analysis and reporting. No other software uses Windows better for the project manager. Primavera takes full advantage of Windows functionality including drag and drop, Object Linking and Embedding, and more.

you'll wonder how you lived without it.

Primavera for Windows will give you what project managers want most. Results. For more information, call 1-800-423-0245.



PRIMAVERA

How the world says project management

Two Bala Plaza • Bala Cynwyd, PA 19004
(610) 667-8600 • FAX: (610) 667-7894

CIRCLE 148 ON READER SERVICE CARD



FREE!
Primavera action video.
Call 1-800-423-0245!

Windows is a trademark of Microsoft Corporation

See us at NE/C Systems Fall '94, Booth #701.

■ Portable Sound

Make Waves with PCMCIA Sound Cards

BY SHERYL CANTER

If you've been coveting the new notebook computers with built-in sound chips, you'll be happy to hear about the PCMCIA sound cards just hitting the market. If your system has a PCMCIA slot, any of these four PCMCIA sound cards—from IBM, I/O Magic, MediaMagic, and New Media Corp.—will add sound to your portable PC inexpensively.

NEW MEDIA .WAVJAMMER

The only Type I card tested, New Media's .WAVJammer (\$399) uses an OPL3 chip for FM synthesis. This makes it register-compatible with the AdLib sound card so it can be used with DOS games and applications that support AdLib. The .WAVJammer's sound quality is generally good, except for the audible click that precedes playing wave files. New Media says this hardware problem will be fixed in the next batch of cards manufactured.

The .WAVJammer is bundled with an OEM version of Microsoft Windows Sound System that doesn't include DOS Sound Blaster support; Sound Blaster requires DMA, which is not part of the PCMCIA specification. The Windows Sound System includes a mixer, a wave-file recorder, a sound-file finder, and a program for controlling your computer through voice commands.

I/O MAGIC TEMPO AND MEDIAMAGIC PCMCIA NOTEBOOK SOUND CARDS

The I/O Magic and MediaMagic cards, which are the same card sold under different brand names, use the same OPL3 chip as the .WAVJammer for FM synthesis. Both are Type II cards with a list

price of \$399, and both come with Voyetra audio software. The software includes a mixer, a wave-file editor; a program for playing, recording, and mixing MIDI files; and a voice-annotation program. The MediaMagic package also supplies a microphone and mini-headphones.

The MIDI portion of the Voyetra software is more capable than the MIDI software bundled with the other products reviewed here. Also, the I/O Magic and MediaMagic cards are the only ones with a MIDI-out jack for connecting to external devices. Unfortunately, the IBM-supplied Card and Socket Services on the ThinkPad 720C prevents DOS support. There are also problems with wave file playback and recording under Windows.

HEAR ME: Any of these four PCMCIA sound cards will liven up your presentations.

Sounds are sometimes repeated in recordings, and wave files skip badly on playback. I/O Magic, the card's maker, said that these problems are currently being investigated. On the other hand, MIDI playback was problem-free, and sound quality was good.

IBM PCMCIA AUDIO CARD

The IBM PCMCIA Audio Card (\$279) is a Type II card with a mono microphone built into the dongle and two stereo jacks (one line-in or microphone and one line-out or headphone). Because

one jack doubles as microphone and line-in, only external microphones with adequate power can be used for recording. IBM recommends the Sony F-VX300.

Rather than use the OPL3 chip for FM synthesis, the IBM sound card emulates the OPL3 chip in software. The result is poor sound quality—noticeably inferior to the other three cards. MIDI playback is marred by annoying background noise. Also, the card is not register-compatible with AdLib and so cannot be used with DOS games, which lack drivers for IBM's proprietary sound specification.

The IBM package includes software for DOS, Windows, and OS/2; if you're running OS/2, the IBM PCMCIA Audio Card is your only choice. The DOS support is really useful only for IBM DOS products, since they are the only ones that provide the proper drivers. The Windows support includes MIDI, wave, and auxiliary drivers, but no mixer driver. An audio-control utility lets you select the type of input and set volume and gain levels. The package also includes a wave-file recorder and editor and a program called Monologue, which gives your computer the ability to read text files aloud.

If sound on the road is in your future, any of these four cards will reproduce at least rudimentary audio—but each has its quirks and drawbacks.

► **.WAVjammer.** List price: \$399. Requires: 2MB RAM, 10MB hard disk space (for Microsoft Windows Sound System), Type I, II, or III PCMCIA slot compliant with PCMCIA 2.1, Microsoft Windows 3.1 or later. New



Media Corp., One Technology Bldg. A, Irvine, CA 92718; 800-453-0550, 714-453-0100; fax, 714-453-0114.

Circle 423 on reader service card

► **Tempo.** List price: \$399. Requires: Type II PCMCIA slot compliant with PCMCIA 2.1, Card and Socket Services 2.0 or later (2.1 recommended), DOS 3.x, Microsoft Windows 3.1 or later. I/O Magic, Freeway Technology Park, 199 Technology Dr., Bldg. #140, Irvine, CA 92718; 714-727-7466; fax, 714-727-7467.

Circle 424 on reader service card

► **PCMCIA Notebook Sound Card.** List price: \$349. Requires: Type II PCMCIA slot compliant with PCMCIA 2.1, Card and Socket Services 2.0 or later (2.1 recommended), DOS 3.x, Microsoft Windows 3.1 or later. MediaMagic, 10300 Metric Blvd., Austin, TX 78759; 800-624-8654, 512-339-3500; fax, 512-454-1357.

Circle 425 on reader service card

► **PCMCIA Audio Card.** List price: \$279; through IBM PC Direct, \$265. Requires: Type II PCMCIA slot compliant with PCMCIA 2.01 or later, Card and Socket Services Version 2.0 or later (2.1 recommended). DOS version: 1MB RAM, DOS 5.0 or later. Microsoft Windows version: 4MB RAM, Microsoft Windows 3.1 or later. OS/2 version: OS/2 2.1 with MMPM/2. IBM PC Direct, 3039 Cornwallis Rd., Bldg. 203, Research Triangle Park, NC; 800-426-2968.

Circle 426 on reader service card

Video card

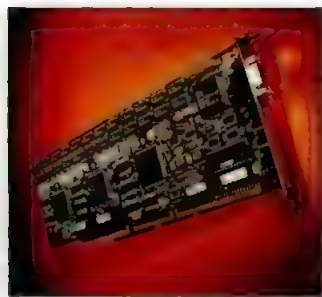
Maxmedia CX/24: Parallel Paths to Fast 24-Bit Color

BY BEN MYERS

At first glance, the Maxmedia CX/24 Graphics Accelerator Card from UMAX Technologies would seem to be a run-of-the-mill VL-Bus graphics card. An inch shorter than a full-length card and based on inexpensive DRAM memory, it offers a few surprises. With 6MB of VRAM and not one but three graphics chips, the Maxmedia combines relatively inexpensive parts to produce a high-end video system that stands in stark contrast to the typical 24-bit graphics card. In testing, it proves to be quite effective and relatively inexpensive.

THREE COLOR CHANNELS

The difference between the Maxmedia and conventional high-resolution video cards is that the Maxmedia segregates and independently processes each of the three color channels in parallel, rather than as a group. Each channel has a dedi-



MEMORY HOG: UMAX's Maxmedia video card uses 6MB of DRAM.

cated S3 86C805 graphics accelerator chip and its own bank of memory. One chip manages all of the red colors bits, a second handles the green bits, and the last does blue. The red, blue, and green components that compose an image are merged together

and displayed by a RAMDAC.

The Maxmedia lists for \$649 with 3MB of memory and \$899 with 6MB, in either ISA or VL-Bus models. The ISA bus cards use a similar S3 86C801 graphics chip, but they are functionally identical to the VL-Bus cards. But you can expect the ISA-bus Maxmedia to be a slower performer in general; this is because of the bottleneck presented by the older ISA bus. A Maxmedia card with 3MB of memory supports true-color graphics at up to 1,152-by-900 resolution, while 1,280-by-1,024 is the maximum resolution supported with 6MB.

On our tests of this singular video system on a 486DX2/66-based PC equipped with a 256K cache, the Maxmedia turned in a Graphics WinMark score of 10.7 million pixels per second when configured for 24-bit color at 1,024-by-768 resolution. By comparison, a Matrox MGA Impression card—one of the most capable boards we've ever evaluated—with VRAM memory and the Matrox MGA graphics chip, produced a Graphics WinMark score of 8.5 on the same configuration. Matrox will soon introduce the Impression Plus, which is an enhancement to the board we tested. The Maxmedia system scrolled and panned effortlessly through 24-bit graphics images and proved quite responsive to all Windows tasks.

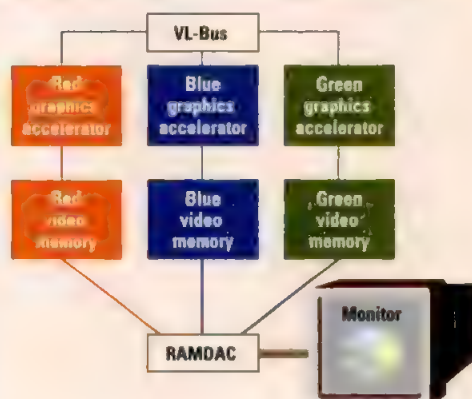
It is easy to set up both the hardware and software to take full advantage of the Maxmedia's capabilities. There is a pair of jumpers used to select a

port address for the card. The Maxmedia installed cleanly with the default jumper settings, but users of networked computers should note that the alternate port address may conflict with the default port address used by many popular network cards.

UMAX supplies a disk to

Video the Three-Channel Way

Red plus blue plus green equals high performance.



install Microsoft Windows 3.1 drivers and control utilities. Demonstrating the card's target market, UMAX also includes video drivers for the AutoCAD family of products (the drivers can also handle 24-bit color), Generic CADD, Microstation PC, and VersaCAD, as well as drivers for the expected Windows and DOS versions of Lotus 1-2-3, Microsoft Word, and WordPerfect. There are also 256- and 16-color Windows drivers included.

CUSTOM HIGH-RESOLUTION

Once the Maxmedia has been installed, the programs in the Maxmedia Windows program group are used to customize the Windows drivers to your needs and to the characteristics of your monitor. Selecting resolution, color depth, monitor refresh

rate, and activating the Maxmedia's virtual desktop feature is done through the Video Panel.

Once your settings have been chosen, you can double-check your choices. The preview button displays a rectangle in the selected graphics mode, which enables you to make sure that the settings match the timings supported by your monitor before committing to the selected resolution. The Monitor Adjustment program lets you fine-tune the monitor settings, centering the monitor image on-screen and adjusting its horizontal and vertical size. If you have

an older monitor, you may find that the settings afforded by the Maxmedia utilities do not allow operation at the monitor's maximum refresh rate for a selected resolution. The Monitor Adjustment program could offer a choice from a wider range of monitor frequencies. For example, a two-year old Nanao Flexscan 9080i monitor was not supported.

A nice touch for graphic artists is a special feature that zooms in on an image, doubling its size. The downside is that you can only view one-quarter of the normal screen. Touching an edge of the visible area with your cursor pans the screen in that direction. Pressing the zoom key a second time reverts back to the full view.

The Maxmedia uses a unique parallel structure to pump pixels through your system. It allows you to take advantage of 24-bit Windows graphics without the usual performance penalty of true color, at a reasonable price.

► **Maxmedia CX/24 Graphics Card.** List price: With 3MB DRAM, \$649; with 6MB, \$899. Requires: VL-Bus or ISA slot. UMAX Technologies Inc., 3353 Gateway Blvd., Fremont, CA 94538; 800-562-0311, 510-651-8883; fax, 510-651-8834.

Circle 419 on reader service card

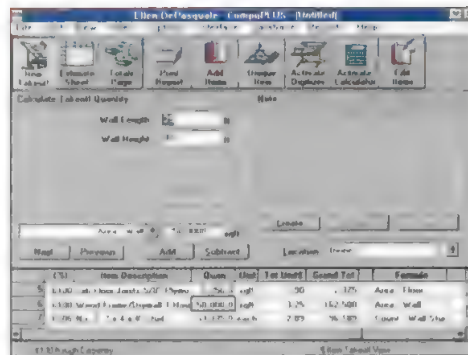
Windows Software

Second-Guess Your Contractor with WinEst

BY ELLEN DEPASQUALE

WinEst 2.1 is a residential contracting cost estimator that takes the guesswork out of calculating the price of a building or an addition. By including everything from net and gross markups to the cost of materials and labor for each phase of the job, WinEst is thorough and complete. It's a power tool for those in the construction business.

The database option in the menu bar breaks all tasks down to understandable increments. Estimating the cost of a concrete retaining wall, for example, is composed of seven steps, from *layout retaining wall* to *strip retaining forms*. You can edit or delete any of the seven steps. Included options are project headings (general conditions, masonry, and the like), project items, and project formulas (in-



CALCULATE: WinEst can map out a construction sequence and estimate its cost.

cluding length, area, and volume).

There is also a standalone construction calculator that does size conversions. Priced at \$495, Win-

Est is not for everyone, but the insight into construction costs it provides will let it pay for itself on the first estimate it generates.

► **WinEst 2.1.** List Price: \$495. Requires: 2MB RAM (4MB recommends), 8MB hard disk space, Windows 3.1. WinEstimator Inc., 8209

South 222 Street, Suite B, Kent, WA 98032; 2800-950-2374; 06-395-3631; fax, 206-395-3634.

Circle 434 on reader service card

Utilities

DocuComp Lets You Collaborate Without Conflicts

BY DAVID HASKIN

Sometimes, even a simple task like editing a document can cause untold headaches when many authors are involved. DocuComp for Windows, Version 3.0 (\$179), highlights the differences between two files, making it an antidote for group writing headaches.

Regardless of the word processor used to create a document, DocuComp is a surprisingly handy utility for tracking

revisions. The program shows deletions or modifications made to the original, then displays both documents side by side. You can then create a single comparison document that shows all changes.

This combination of tools makes it easy, for example, for lawyers to compare the contents of two contracts. DocuComp was easy to use and fairly quick. On a 33-MHz 486 computer with 16MB of RAM, it took only about 6 minutes to compare two 13-page documents.

DocuComp does have a couple of shortcomings. Most notably, it occasionally missed modified items that were moved using Word for Windows' drag-and-drop capabilities, particularly

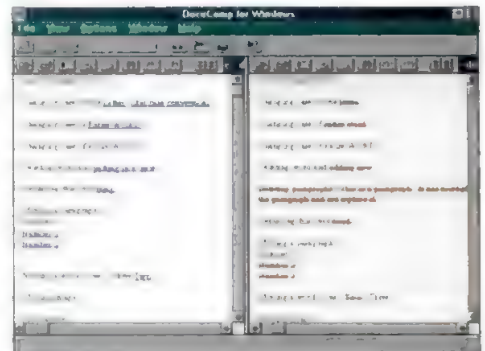
when the moved items contained only a few words.

Still, DocuComp is a surprisingly useful time-saver for those who write in group situations.

► **DocuComp for Windows, Version 3.0.** List Price: \$179. Requires: 2MB RAM, 3MB hard disk space,

Microsoft Windows 3.1 or later. Mastersoft Inc., 8737 E. Via de Commercio, Scottsdale, AZ 85258; 800-624-6107, 602-948-4888; fax, 602-948-8261.

Circle 433 on reader service card



COMPARE: DocuComp lets you view the original and marked-up copy simultaneously.

Fax

ComScan Turns Your Fax Machine into a Scanner

BY BRIAN NADEL

If you occasionally needed to turn paper documents into digital form, you had two expensive alternatives: Either buy a dedicated scanner or use a service bureau. You now have a third choice: Command Communications' \$139 ComScan, a device that turns your fax machine into a scanner. ComScan is convenient and easy to use, but its

scans are limited by the resolution of your fax machine.

Setup is deceptively simple: Just plug the small ComScan box (5.25 by 4.75 by 1.75 inches) into the incoming phone line, the fax machine, and your PC's fax modem; there's no software to worry about. When you're ready to scan a document, your fax machine acts as a scanner and ComScan, which connects directly to your fax modem, simu-



DIGITIZE. ComScan connects to your fax machine and PC to produce a crude but effective scanner.

lates the phone ring needed to start your PC's fax receive program. The resolution of a typical

Group 3 fax machine—200 by 200 dots per inch—is adequate for text.

ComScan can sense whether an incoming call is a fax or data transmission. It can also let you use your fax machine as a printer. But even though ComScan is an adequate and inexpensive scanning solution, it's no match for a true scanner.

► **ComScan.** List Price: \$139. Requires: PC with fax modem and fax machine. Command Communications Inc., 10800 E. Bethany Dr., Aurora, CO 80014; 800-288-6794, 303-751-7000; fax, 303-750-6437.

Circle 432 on reader service card

Go Ahead, Get Carried Away

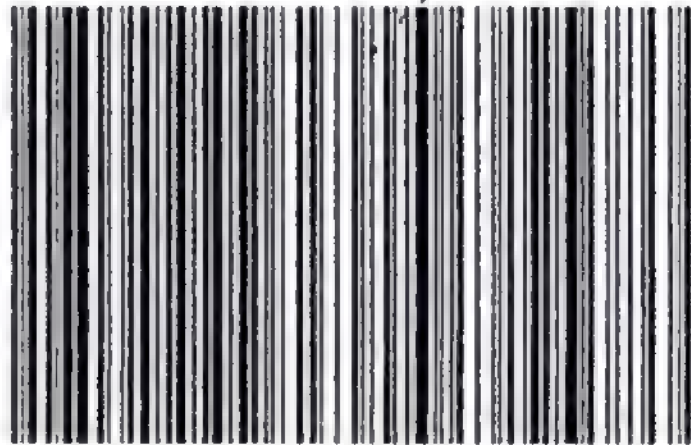




1. Follow instructions on the other side

Back

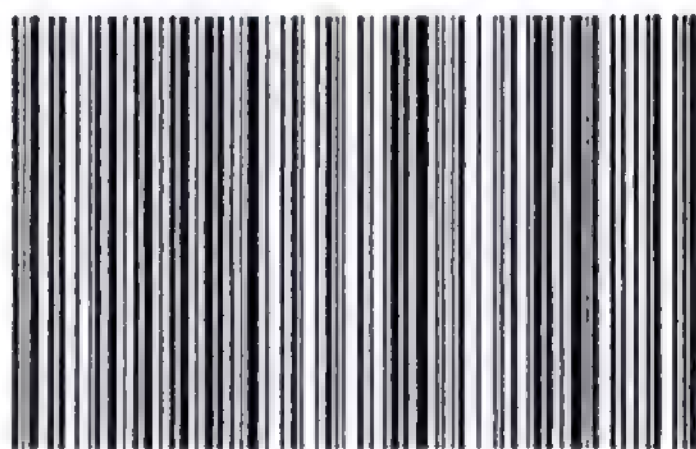
GbsSlipBack-0018



Inverted Back

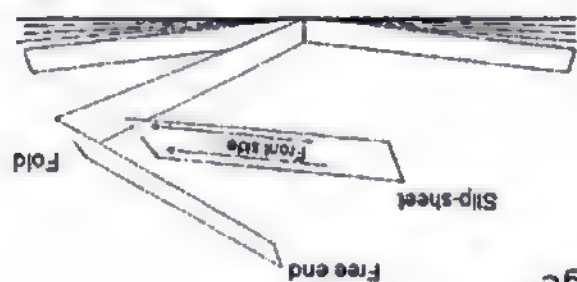
1. Follow instructions on the other side

Folded edge of the page



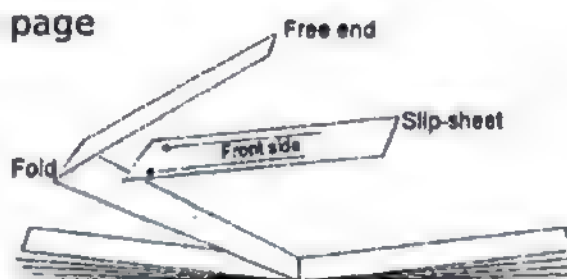
Inverted Foldout slip-sheet

Foldout slip-sheet



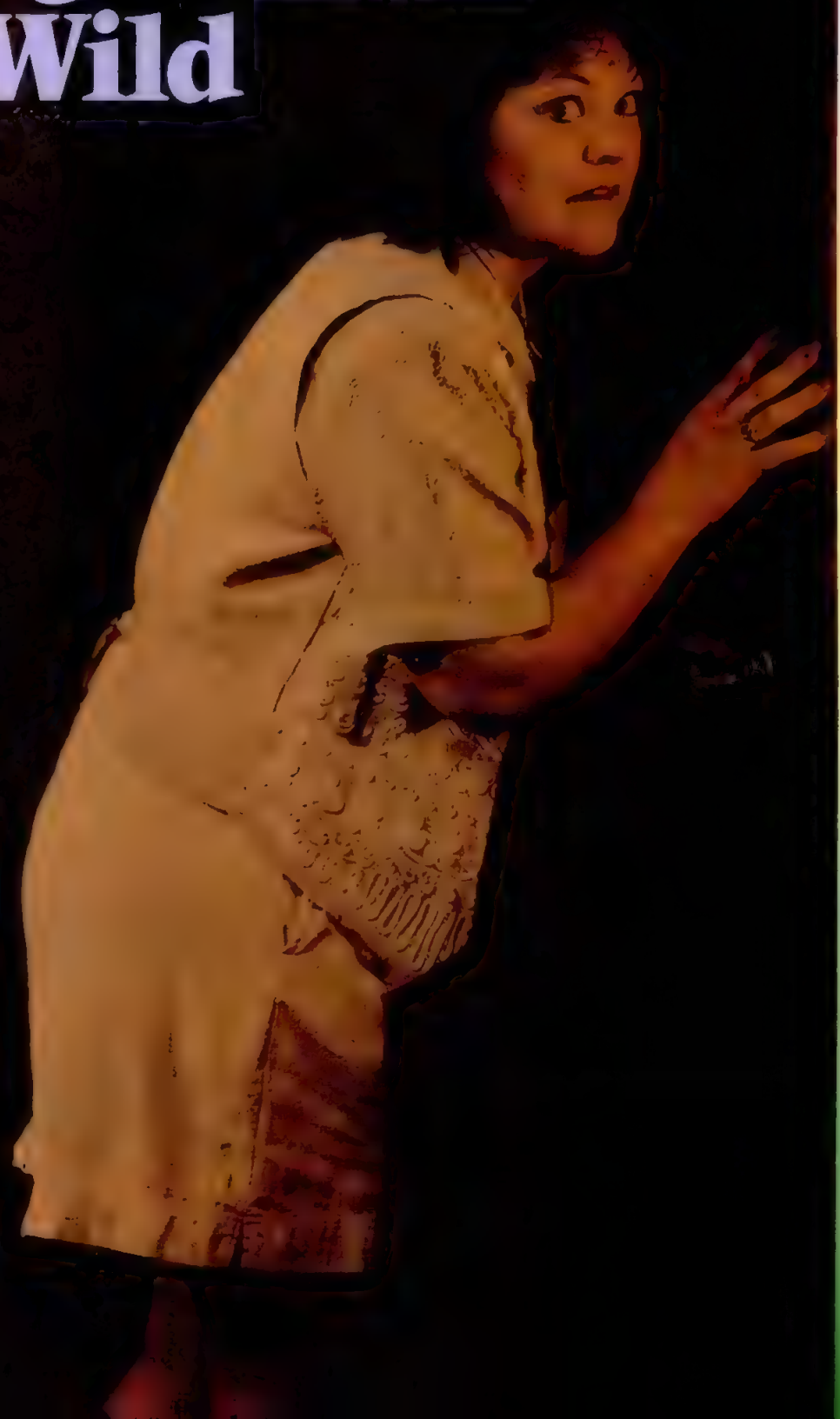
1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet

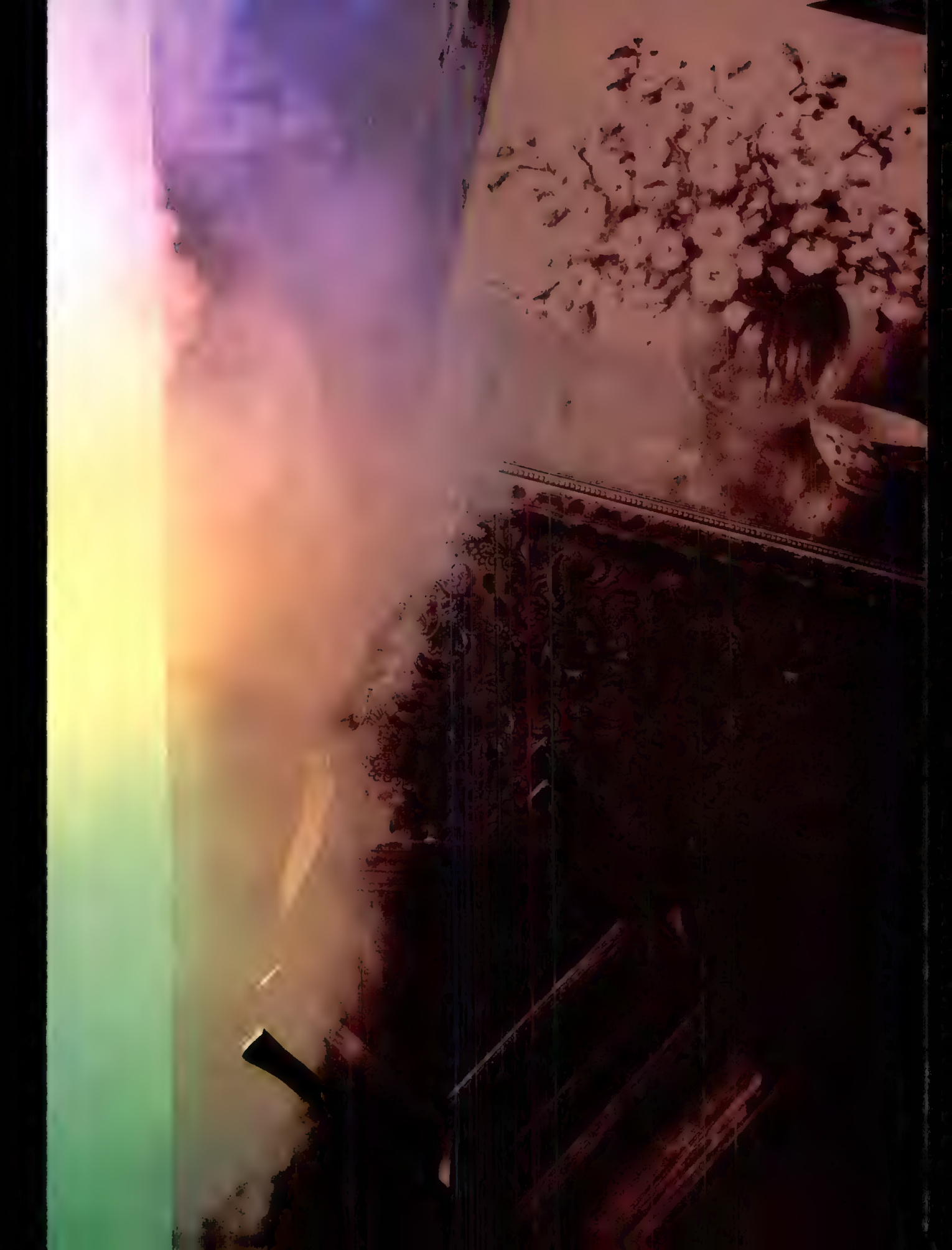
1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet





Let Your Imagination Go Wild





Experience the World of Gateway 2000!

Go ahead. Let yourself get carried away. Because when you buy a computer from Gateway 2000®, you can lose yourself in a whirlwind of extraordinary computer systems and fantastic software. You'll feel like there's absolutely nothing on earth you can't do! So let your imagination run wild. Soon you'll be opening the doors to Gateway 2000 where prices are a breeze and computer dreams really do come true!

Most Gateway desktop systems now include larger hard drives, including a 1GB hard drive on our P5-90XL Pentium™-based machine. So there's no way you can get caught short of space. A TelePath™ fax/modem is included on our new Pentium-based multimedia systems. And CD-ROM drives are standard on all desktop systems. Just imagine what you can accomplish with Microsoft's Office Professional, including the latest versions of MS Word, Excel, PowerPoint® and Access®, now standard on all 486 PCI and Pentium-based systems.

A standard three-year limited parts warranty on all desktop systems and Gateway monitors tops off our tradition of bringing you the best service and support in the industry.

Sound too good to be true? Well, that's not all. The Gateway HandBook® 486 portable PC is now priced at legendary low prices.

Gateway 2000 has grown to become a Fortune 500 company, but we're still the down-to-earth Midwesterners who have always given you a good old-fashioned value. Go ahead, take a visionary's leap into the Gateway 2000 experience. Soon you'll be saying, "There's no place like Gateway, there's no place like Gateway."



8 0 0 - 8 4 6 - 2 0 6 3

All the incredible talent in this ad is provided by Gateway 2000 employees and family members.



Everything Under The Sun!

Supernatural power. Mesmerizing features. Stunning software. It's the Gateway 2000® experience. A place where you can have the best CPUs in the land — and so much more — when you buy a Gateway 2000 Pentium™-based system. And while others are huckstering their stripped-down Pentium-based computers, Gateway presents systems packed with the all the stuff dreams are made of!

There's virtually no end to the features included: hard drives up to 1GB, CD-ROM drives, outstanding sound and video performance, the best software, fax/modems on two new multimedia models, and a standard three-year limited parts warranty.

Your dream machine no longer eludes you. Gateway 2000 is making those dreams come true!

Raising The Roof Extras

We always want to keep our customers ahead of the industry. So along with Intel®'s super-charged Pentium processor, Gateway helps you extend the life of your system by including

incredible 540MB, 730MB or 1GB hard drives on all Pentium-based systems. Get used to the feeling of being spoiled, because you also get CD-ROM drives, superior video performance *and* a ton of memory on *all* desktop systems!

All Pentium processor-based models include a PCI local bus and an enhanced PCI/IDE controller allowing your hard drive to transfer data up to twice as fast as non-enhanced systems.

And now Gateway's high-quality desktop systems *and* Gateway monitors are backed by a three-year limited parts warranty. Believe it — this is one of the best warranties you'll find anywhere!

Multimedia Mania

For those who insist on only the very best, your Shangri-La is our new P5-60 and P5-90 Best Buy multimedia systems. Watch out, 'cuz they're jam-packed with all the premium multimedia features you can imagine! Including a TelePath™ fax/modem and communications software so you can speak to the world from your own living room. And tunes never sounded so good with a 16-bit



sound card and Yamaha® stereo-quality speakers. Play your audio CDs, hear audio clips or record audio all in perfect harmony.

Wondering what "multimedia" *really* means for you? It's a whole new universe of knowledge, entertainment, communication *and* educational capabilities. Talk about being entranced! You'll experience interactive, full-motion video and stereo audio. And Gateway gives you the key to this universe in a super-fast, feature-packed machine.

Get the best of all possible worlds with these new P5-60 and P5-90 Best Buy multimedia machines!

Software Nirvana

It's a sweet deal. All Gateway Pentium-based systems now come with Microsoft Office Professional, an incredible combination of Microsoft's most popular business applications, including Microsoft Word, Excel, PowerPoint® presentation graphics program, and Access® database, all on a single CD with on-line manuals.

These programs in Office Professional are so tightly integrated, they work together as if they were a single

program. Also included is Corel Professional Photos CD Sampler with tools to view Photo CD images.

Call for more great software options including our value-packed Multimedia Starter Pack.

P5-90XL Paradise

Is it fantasy or for real? Well, it's the Gateway P5-90XL. This ultimate high-flying Pentium-based PC has a larger-than-life 1GB hard drive. You're gonna get all the power and speed you need for today *and* tomorrow! And an ATI GX video card using the Mach 64 graphics accelerator, one of the first and fastest 64-bit accelerators on the market. It's awe-inspiring to see the display on the 17-inch CrystalScan® monitor. Sound, you ask? Ensoniq®'s Soundscape™ wavetable sound card makes a staggering difference in audio quality. And you'll get a great balance of crisp highs and plenty of heart-pounding bass — in full stereo sound — from the Altec Lansing ACS-31 speakers, with subwoofer.

And for the system of *your* dreams, we'll configure a system specifically to fit your needs. Get everything under the sun with a powerful value-packed Pentium-based system from Gateway 2000!



"You've got a friend in the business"™

8 0 0 - 8 4 6 - 2 0 6 3



You'll be in paradise with a loaded Gateway P5-90XL machine!

Know No Boundaries



GATEWAY2000
COLORBOOK

You'll be transported to outer bounds when you discover the ColorBook™ from Gateway 2000®. Experience the rapture of color portability *and* performance with a 250MB hard drive on our 50MHz and 75MHz models. A rainbow of 256 brilliant colors in VGA mode bursts from an incredible 10-inch dual-scan screen on three ColorBook models. You won't find another portable screen this big, this affordable, anywhere else.



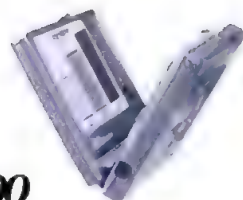
And while everyone else is hiking up their color portable prices, Gateway still offers you an incredible value on our feature-packed ColorBooks, from the \$1,999 SX model right up to the DX4-75. And our DX2-50 model recently won *PC World's* Best Buy award in the Power Mobile PC category.

All Gateway ColorBooks are based on the Intel® SL Enhanced 486 processor with enough power and memory to run all your Windows applications. Weighing less than 5.7 pounds, measuring 1.77-inches thin, all models include two PCMCIA Type II or one Type III slots, excellent battery life, carrying case and a great suspend/resume feature. Our DX2 and DX4 models also include PCMCIA fax/modems. You also get Microsoft Works™ or MS Office Professional standard.

No, it's not an illusion ... it's the ColorBook from Gateway 2000.



GATEWAY2000
HANDBOOK 486



Visualize the ideal portable experience. On the road to enlightenment you'd like to have a lightweight, compact, real 486 PC at an uncommonly low price. The Gateway 2000 HandBook® 486 is so extraordinary, it's portable computing utopia! With unbelievable prices on all HandBook models (they start at just \$999!) there's never been a better time to indulge yourself in a world of 486 power that you can take anywhere.

The HandBook's slight frame — weighing less than three pounds and measuring roughly 10 x 6 inches — makes it an enchanting little PC. The HandBook DX2-50 gives you more MIPs per pound than any other portable PC. With Microsoft Office Professional included, the DX2-50 is an unbeatable value. And at these prices you can get the HandBook as a companion to your desktop system.

The HandBook's features are astounding. It has a bright, backlit VGA screen and a comfortable, touch-type keyboard along with an external diskette drive and leather carrying case. With two batteries included, the HandBook also lets you "hot swap" — change batteries or peripheral while the PC is running without rebooting the system or losing data.

All Gateway ColorBook and HandBook portable PCs come with a standard one-year limited parts warranty. A special VIP warranty is available only at the time of purchase for an additional \$100.



You Can Have It All!

The Gateway 2000 Family PC

There's no place like home when you have a Gateway 2000® Family PC™ in the house. Every member of your family will be swept away as they discover inspiration, entertainment and learning experiences.

This fully equipped multimedia system takes you to a whole new dimension. You get a fast CD-ROM drive to run the best programs and games with sound, pictures, animation and video. With its high-quality sound card and speakers, the Family PC lets you play music CDs, hear audio clips or record audio — all with magical stereo sound.

The Family PC's fax/modem has all the communication software you need to access information and other computer users from all over the world through on-line services.

Experience a virtual software playground with Microsoft Works™ Multimedia Edition, MS Encarta 1994 Multimedia Encyclopedia, MS Money,™ new MS Complete Baseball, MS Golf, and Corel Professional Photos CD Sampler.

You won't find another home PC more loaded than the Gateway Family PCs and our Pentium-based multimedia systems — in any land.

3-Year Warranty

Gateway desktop systems come with one of the strongest warranties in the industry. All Gateway 2000 desktop PCs are backed by a three-year limited warranty on parts. The new three-year limited parts warranty includes Gateway monitors.

Gateway customers also receive a 30-day money-back guarantee and toll-free technical support. And *PC Magazine* readers recently honored us, for the fourth consecutive time, with their highest rating in *PC Mag's* Service and Reliability survey.

On-site service is available during the first year in most U.S. locations and may be provided without charge if our technicians determine it necessary.

For details on our new warranty and all of our service and support policies, please call or write for a free written copy.

Payment Options

Gateway accepts most major credit cards and C.O.D. terms, with net 30-day terms and leasing options available to qualified commercial customers. You can also apply for the Gateway 2000 DuoLine™ MasterCard® Card, issued by Dial National Bank, Des Moines, Iowa.

To Other Worlds

Gateway 2000 customers in Canada and Puerto Rico receive toll-free telephone service in both countries (see the back page of this ad for special 800 numbers) along with award-winning technical support and CSA approvals. On-site service is available in some Canadian and Puerto Rican locations, and our international shipping rates are among the most competitive in the industry.



8 0 0 - 8 4 6 - 2 0 6 3

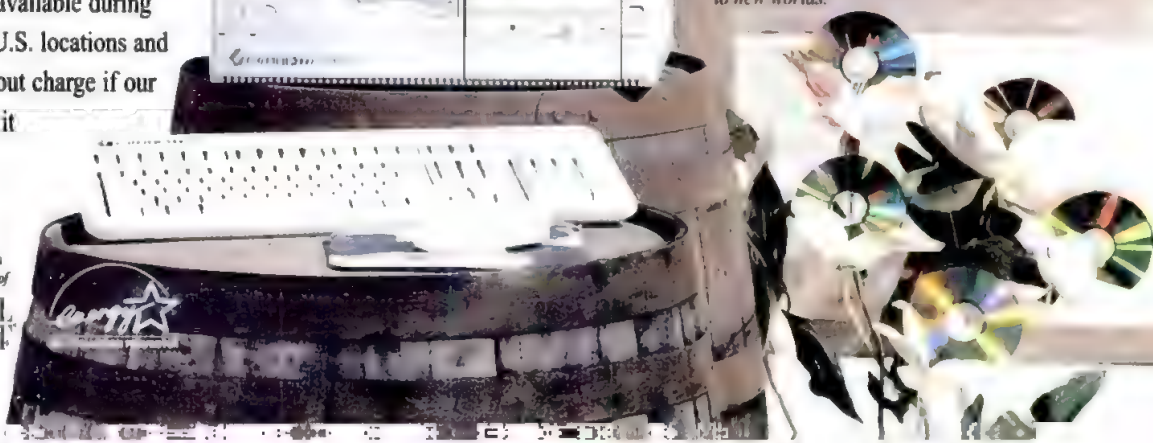


A Gateway 2000 Family PC is your doorway to new worlds.



Printed on recycled paper with soy inks.

Gateway 2000 is a corporate sponsor of
GLOBAL PEOPLE



Multimedia Systems

4SX-33 FAMILY PC™

- Intel® 33MHz 486SX CPU*
- 4MB RAM
- 340MB 13ms IDE Hard Drive
- Local Bus Graphics with 1MB
- ▼ Double-Speed CD-ROM, 16-Bit Sound Card & Speakers
- ▼ 2400/9600 Data/Fax Modem
- 3.5" Diskette Drive
- 14" Color SVGA Monitor
- Mini Desktop Case
- 101-Key Keyboard & Mouse
- MS-DOS® 6.2 & WFW 3.11
- ▼ MS Works™, Encarta, Baseball, Money™, & Golf
- ▼ 3-Year Limited Parts Warranty

\$1499

4DX2-66 FAMILY PC

- Intel 66MHz 486DX2 CPU*
- 8MB RAM, 128KB Cache
- 420MB 13ms IDE Hard Drive
- Local Bus Graphics with 1MB
- ▼ Double-Speed CD-ROM, 16-Bit Sound Card & Yamaha® Speakers
- ▼ 2400/9600 Data/Fax Modem
- 3.5" Diskette Drive
- 14" Color SVGA Monitor
- Mini Desktop Case
- 101-Key Keyboard & Mouse
- MS-DOS 6.2 & WFW 3.11
- ▼ MS Works, Encarta, Baseball, Money, & Golf
- ▼ 3-Year Limited Parts Warranty

\$1999

P5-60 BEST BUY

- Intel 60MHz Pentium™ CPU*
- 8MB RAM, 256KB Cache
- 540MB 13ms IDE Hard Drive
- PCI Enhanced IDE Interface
- PCI Local Bus Graphics with 1MB
- ▼ Double-Speed CD-ROM
- ▼ 16-Bit Sound Card & Yamaha Speakers
- ▼ TelePath™ II 14.4K Fax/Modem
- 3.5" Diskette Drive
- 15" Color CrystalScan® Monitor
- Desktop Case
- 101-Key Keyboard & Mouse
- MS-DOS 6.2 & WFW 3.11
- ▼ MS Office Professional CD
- ▼ 3-Year Limited Parts Warranty

\$2499

P5-90 BEST BUY

- Intel 90MHz Pentium CPU*
- 8MB RAM, 256KB Cache
- 730MB 13ms IDE Hard Drive
- PCI Enhanced IDE Interface
- PCI Local Bus Graphics with 2MB
- ▼ Double-Speed CD-ROM
- ▼ 16-Bit Sound Card & Yamaha Speakers
- ▼ TelePath II 14.4K Fax/Modem
- 3.5" Diskette Drive
- 15" Color CrystalScan Monitor
- Desktop Case
- AnyKey® Keyboard & Mouse
- MS-DOS 6.2 & WFW 3.11
- ▼ MS Office Professional CD
- ▼ 3-Year Limited Parts Warranty

\$2999

Professional Systems

4SX-33

- Intel 33MHz 486SX CPU*
- 4MB RAM
- 340MB 13ms IDE Hard Drive
- Local Bus Graphics with 1MB
- ▼ Double-Speed CD-ROM
- 3.5" Diskette Drive
- 14" Color SVGA Monitor
- Mini Desktop Case
- 101-Key Keyboard & Mouse
- MS-DOS 6.2 & WFW 3.11
- ▼ MS Works 3.0 CD
- ▼ 3-Year Limited Parts Warranty

4SX-33 \$1299

4DX2-66 \$1599

(w/ 540MB Hard Drive)

P4D-66

- Intel 66MHz 486DX2 CPU*
- 8MB RAM, 128KB Cache
- 730MB 13ms IDE Hard Drive
- PCI Enhanced IDE Interface
- PCI Local Bus Graphics with 1MB
- ▼ Double-Speed CD-ROM
- 3.5" Diskette Drive
- 15" Color CrystalScan Monitor
- Desktop Case
- AnyKey Keyboard & Mouse
- MS-DOS 6.2 & WFW 3.11
- ▼ MS Office Professional CD
- ▼ 3-Year Limited Parts Warranty

\$2199

P5-60

- Intel 60MHz Pentium CPU*
- 8MB RAM, 256KB Cache
- 540MB 13ms IDE Hard Drive
- PCI Enhanced IDE Interface
- PCI Local Bus Graphics with 1MB
- ▼ Double-Speed CD-ROM
- 3.5" Diskette Drive
- 15" Color CrystalScan Monitor
- Desktop Case
- AnyKey Keyboard & Mouse
- MS-DOS 6.2 & WFW 3.11
- ▼ MS Office Professional CD
- ▼ 3-Year Limited Parts Warranty

\$2299

P5-90 XL

- Intel 90MHz Pentium CPU*
- 16MB RAM, 256KB Cache
- ▼ 1 GB 10ms IDE Hard Drive
- PCI Enhanced IDE Interface
- ▼ ATI Mach 64 with 2MB VRAM
- ▼ Double-Speed CD-ROM
- ▼ 16-Bit Wavetable Sound Card & Aicec ACS-31 Speakers
- 3.5" Diskette Drive
- 17" Color CrystalScan 1776LE
- Tower Case
- AnyKey Keyboard & Mouse
- MS-DOS 6.2 & WFW 3.11
- ▼ MS Office Professional CD
- ▼ 3-Year Limited Parts Warranty

\$3999

Portables

HANDBOOK® 486

- 2.94 Lbs., 9.75" x 5.9" x 1.6"
- SL Enhanced Intel 486 or DX2 Processor
- 4MB or 8MB RAM (expandable to 20MB)
- 80 to 250MB IDE Hard Drive
- External 3.5" Diskette Drive
- 7.9" Backlit VGA Display
- 2 NiMH Batteries & AC Pack
- Suspend/Resume Feature
- 1 PCMCIA Type II Slot
- EZ Point™ Integrated Pointer
- 78-Key Keyboard
- Parallel, Serial & PS/2® Ports
- Leather Carrying Case
- MS Works for Windows 3.0 or MS Office Professional
- MS-DOS 6.2, WFW 3.11 & Serial Transfer Cable

HANDBOOK 486SX-25

4MB RAM, 80MB Hard Drive, Works

\$999

HANDBOOK DX2-40

8MB RAM, 130MB Hard Drive, Works

\$1499

HANDBOOK DX2-50

8MB RAM, 250MB Hard Drive, MS Office Professional

\$2499

COLORBOOK™

- 5.7 Lbs., 11.7" x 8.5" x 1.77"
- SL Enhanced Intel 486, DX2 or DX4 Processor
- 4MB or 8MB RAM (expandable to 20MB)
- 3.5" Diskette Drive and Removable 250MB IDE Drive
- 10.3" or 9.4" VGA Dual-Scan STN Color Display
- NiMH Battery & AC Pack
- Suspend/Resume Feature
- 2 PCMCIA Type II Slots (1 Type III)
- Integrated Trackball (2 buttons)
- 85-Key Keyboard
- Parallel, Serial, PS/2 & VGA Ports
- MS Works or Office Professional
- MS-DOS 6.2 & WFW 3.11

COLORBOOK 486SX-33

4MB RAM, Case, Works

\$1999

COLORBOOK DX2-40

4MB RAM, Fax/Modem, Case, Works

\$2699

COLORBOOK DX2-50

8MB RAM, Fax/Modem, Case, Office Professional

\$3199

COLORBOOK DX4-75

8MB RAM, TelePath Fax/Modem, Case, Office Professional

\$3699



Toll free from Canada
800-846-3609



Toll free from Puerto Rico
800-846-3613



"You've got a friend in the business."™

8 0 0 - 8 4 6 - 2 0 6 3

*Intel Verified:
Upgradable



Extraordinary Extras!

A wonderland of value: Gateway 2000's peripherals and software, sold only with the purchase of a system.

MULTIMEDIA

Basic Audio Multimedia Kit

Here's everything you need to add multimedia to a Gateway PC.

- Gateway 2000 16-bit CD-quality sound card, compatible with Sound Blaster™ cards, with MIDI/game port, mic in, stereo line in/out
 - 2 Labtec® CS-180 speakers
- \$109 (with system purchase)**

Wavetable Audio Multimedia Kit

Once you've heard wavetable audio, basic audio will never do!

- Ensoniq® Soundscape™ 16-bit wavetable sound card, MT-32 and FM mode compatible. Supports most software for popular sound cards and standards including General MIDI, Sound Blaster, AdLib, Roland MPU 401, MS Windows Sound Sytem and MT 32
 - New Altec Lansing ACS-31 three-piece speaker system
 - MidiSoft® Sound Explorer and Time Warner's Aegis™ software
- \$249 (with system purchase)**

Altec Lansing ACS-31 Speakers

A Gateway exclusive from Altec Lansing: a three-piece speaker set at a two-piece price. Two 3-inch free-standing speakers crank out up to five watts per channel while the subwoofer can deliver 15 watts of heart-pounding bass. **\$119**

Multimedia Software Starter Pack

You get nearly \$700 worth of software for less than **\$100!** Package includes Cinemania '94, Mad Dog McCree, Tuneland, Mayo Clinic Family Health Book, Better Homes and Gardens Cookbook, The Lawnmower Man, Sitting on the Farm, Mavis Beacon Teaches Typing, Chess Master 3000, U.S. Atlas and World Atlas. You also get a compact disc cleaner and 20-disk storage rack. **\$129**

MONITORS

CrystalScan® 17-Inch Monitor

Non-interlaced color monitor with intelligent multi-scanning analog color display capable of 1280 x 1024 resolution in non-interlaced mode, .26 dot pitch.

Upgrade from a 14-inch CrystalScan 1024NI monitor **\$395**

Upgrade from a 15-inch CrystalScan 1572 monitor **\$335**

(Prices good only for upgrades at the time of system purchase.)

COMMUNICATIONS & STORAGE

TelePath™ II Fax/Modem

Internal fax/modem, 14,400bps modem, V.32bis, with 14,400bps fax capability. Includes CommWorks™ data and fax communication software, CoSession™. Host remote diagnostics, plus a CompuServe® trial membership. **\$99**

Colorado Memory Systems® TBU

250MB internal tape backup unit copies up to 9.5MB per minute. Comes with MS Windows™ and DOS software, one tape and cable. **\$149**

PRINTERS

Hewlett-Packard 4L LaserJet Printer

A full-featured 300dpi printer loaded with enhanced PCL 5 and 26 scaleable typefaces with 1MB standard HP Memory Enhancement Technology. Parallel cable included. **\$699**

Hewlett-Packard 4L LaserJet Printer

A 600dpi printer for four times the dots of 300dpi laser printing with enhanced PCL 5 and 45 scalable typefaces. 2MB standard memory and 3 universal SIMM slots available for additional memory or PostScript fonts. Parallel cable included. **\$999**

Epson® Stylus™ 800 Ink Jet Printer

Get the look of a laser at a dot matrix price with the Stylus 800. Prints 150 characters per second at 360dpi — fast and quiet! **\$289**

Call for other printer options, including more **Hewlett-Packard** printers.

NETWORKING

Ethernet Adapter from 3Com®

Ultra high-performance 16-bit Ethernet cards from the world leaders in Ethernet technology.

16-bit Triple Media Card supports BNC, AUI and Twisted Pair media **\$119**

16-bit Twisted Pair only **\$99**

Token Ring

IBM® 16-bit Token Ring card **\$429**

PORTABLES

Peripherals and upgrades available only with a Gateway portable purchase.

PCMCIA Cards:

- TelePath 14,400 Fax/Modem. **\$249** ■ Token Ring adapter. **\$449**
(Also in XJACK® version, same price) ■ HandBook® VGA adapter. **\$229**

- 9,600/2,400 Fax/Modem. **\$149**

- Ethernet adapter. **\$149**

Other Accessories

- 2.2Ah NiMH batteries. Call for prices
- HandBook 3.5" external floppy. **\$99**
- ColorBook™ carrying case. **\$49**
- HandBook leather carrying case. **\$55**
- Extended VIP warranty — we ship a replacement to you within 24 hours during warranty. Point of sale only. **\$100**

Call the Gateway 2000 special Component Add-ons division at 800-846-2080 for our complete line of extras for Gateway customers.



"You've got a friend in the business.™"

8 0 0 - 8 4 6 - 2 0 6 3

Electronic Reporter

WordPerfect Envoy 1.0: Was It Worth the Wait?

BY LORI GRUNIN

Envoy's initial appearance in the portable document market occurs as its competitors—most notably Adobe Acrobat and No Hand's Common Ground—ramp up for their second versions. Though late in the game, WordPerfect learned from its competitors' experience and dutifully outfitted its \$189 emis-

sary. Envoy's feature set and its implementation strike the right balance for electronically distributing memos, reports, and other materials intended for reading and annotation.

You create an Envoy document by printing to a virtual device the program sets up during installation. The File/Import command in the Viewer, or the drag-and-drop option from the File Manager, will open the selected document in its native application and print it to the

Envoy driver. You can configure the driver to embed the relevant TrueType fonts or simply tell it to embed all nonstandard TrueType fonts.

The program's Viewer application lets you view, annotate, and generate hyperlinks for your documents. You can also search for phrases, and copy and paste text or graphics to other applications. You can also embed a freely distributable runtime version of the program's Viewer, which includes

all the annotation tools, and the program is mail-enabled for sending files across network e-mail systems directly.

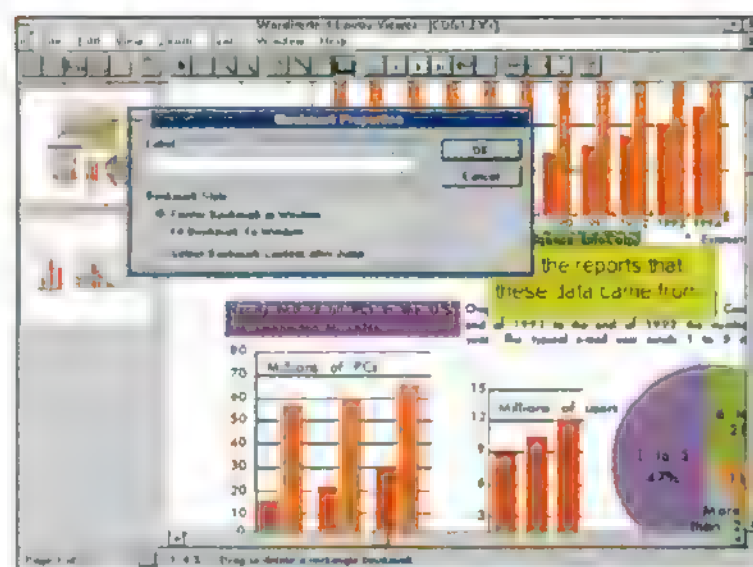
Envoy's annotation tools are a bit more powerful than its competitors'. The program can import notes, highlights, hyperlinks, bookmarks, and OLE links from another Envoy document. Combining pieces of a variety of documents is as easy as dragging and dropping thumbnails.

There are absences in Envoy's capabilities, most notably its lack of PostScript support. WordPerfect plans to offer

a way to import the PDF files generated by the Adobe Acrobat Distiller by the end of this year, and the company will eventually supply a PostScript interpreter of its own. Although WordPerfect ships a Windows and a Macintosh version of the product, no DOS Viewer will appear in the near future.

On the whole, Envoy fills the needs of those who want to send relatively simple files around their company.

► **WordPerfect Envoy 1.0.** List Price: \$189. Requires: 500K



BOOKISH: Envoy lets you create named bookmarks with different zoom characteristics.

RAM, 1MB hard disk space, Microsoft Windows 3.1 or later. WordPerfect; the Novell Applications Group., 1555 N. Technology Way, Orem, Utah 84057; 800-451-5151; 801-228-9929; fax, 801-228-5077.

Circle 435 on reader service card

Forms Software

Teleform Manages Forms, Faxes, and OCR

BY JOHN R. QUAIN

The only task more onerous than filling out a form is having to enter all the completed information into a database. By combining forms design, faxing, and OCR capabilities, the \$1,495 Teleform for Windows, Version 3.0, makes automated forms-processing on the desktop a possibility.

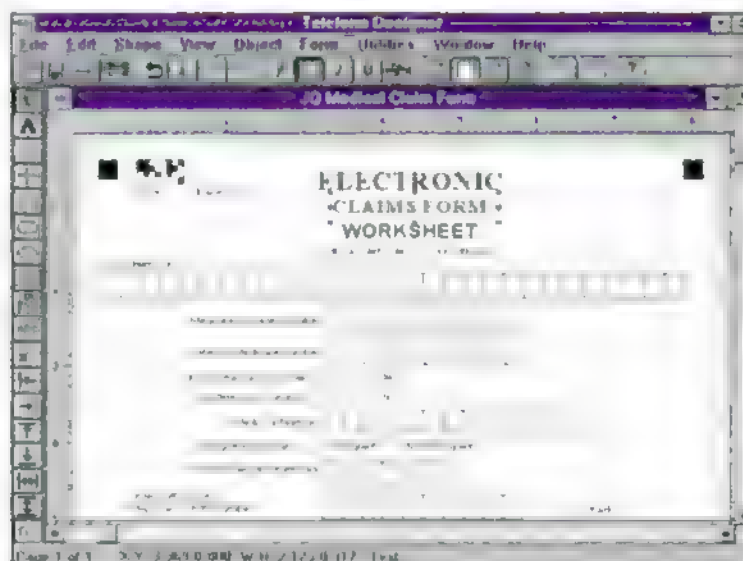
The integrated package is designed to let you create forms, such as surveys or orders, fax them to customers, and then receive the completed forms via fax. An OCR component recognizes hand printing (not cursive handwriting), turns it into

ASCII text, and inserts it into predetermined fields in the database format of your choosing. Mailed-in responses can be scanned.

The program's forms designer has extensive editing functions, unlimited use of fonts, and improved alignment tools. It's intended for serious business use,

so beginners will find that Teleform's forms designer requires patience.

Completed form designs are identified by a binary code at the top of each page that correlates



ATOMATED FORMS: Teleform's forms designer lets you use unlimited fonts.

the form with a master document, so that the delimited fields are correctly identified.

FaxWorks is responsible for the communications tasks. It enables you to send out thousands of forms at a time, and Cardiff has even built in a dunning fax: If your recipients don't

respond within a certain time frame, the program will automatically send you a fax reminder. In hands-on tests, Teleform worked with several different fax modems without a hitch. Responses interpreted by the Nestor OCR engine were good but not perfect; quality was determined by the writer's penmanship. Once the data has been recognized, it can be entered automatically in a variety of database formats.

Large companies handling thousands of forms should note that Cardiff plans to release a multi-user version of Teleform (\$1,495 per station) that can be shared across a network.

Now, if only we could reduce the number of forms we have to fill out.

► **Teleform for Windows, Version 3.0.** List Price: \$1,495; upgrade

price, \$249. Requires: 8MB RAM, 40MB hard disk space, Microsoft Windows 3.1 or later, fax board or fax modem. Cardiff Software Inc., 531 Stevens Ave., Bldg. B, Solana Beach, CA 92075; 800-659-8755, 619-259-6430; fax, 619-259-6450.

Circle 436 on reader service card



From September 12 through September 16, go on-line and discuss WordPerfect Envoy portable document technology with reviewer Lori Grunin, WordPerfect product executives, and representatives from Tumbleweed Software, developers of Envoy. Type GO EXEC at any CompuServe prompt.

Corel VENTURA™

POWERHOUSE PUBLISHING!

5

VENTURA POWER *with* **COREL EASE OF USE!**

Corel VENTURA 5 offers the precision and power to take any document from conception to completion. With an intuitive new interface and powerful architecture that supports both structured and freeform documents, Corel VENTURA 5 can produce all your publishing, quickly, easily and accurately. New features include irregular text wrapping, incremental rotation of text and objects, customized presets, OLE 2.0 in-place editing and advanced cross-referencing and indexing capabilities. Combined with the artistic power of Corel PHOTO-PAINT 5, Corel VENTURA 5 is the ideal tool for creating newsletters, catalogs, technical manuals, brochures and more.

Includes
COREL PHOTO-PAINT 5™
The Best in Photo-Editing and Bitmap Creation

COMPUTER *City* **SUPERCENTER**
1-800-826-3928

\$495
Manufacturer's Suggested Retail Price

* Manufacturer's List Price in US\$. Dealer may sell for less.
CIRCLE 322 ON READER SERVICE CARD

COREL®
1-613-728-3733 ext.20

KUR-0076

■ Graphics

PhotoGenix Creates Screen-Saver Slide Shows

BY DANIEL GROTTA AND SALLY WIENER GROTTA

Why settle for flying toasters, fighting Klingons, or the indignity of a blank screen when you can create a customized screen saver with photographs, drawings, or images of any kind? That's the idea behind PhotoGenix, a \$149 program that not only allows users to produce their own Windows-based screen-saver slide shows but comes with a license that permits unlimited royalty-free distribution of runtime modules for advertising or promotional purposes.

PhotoGenix is so simple that a first-time user can create a screen-saver show in minutes. The first step is to select a previously created image file—in Targa, TIFF, .BMP, .GIF, or JPEG format—or use one of 200 royalty-free photos included on the CD-ROM. Next, use a mouse to select how long the image will stay on the screen, as well as one of 15 incoming and outgoing transition effects. PhotoGenix will run through a slide show of up to 200 images, displaying each image for a duration ranging from 1 second to 10 minutes. You can easily change the order in which the images appear and add or delete individual slides at any time.

When you're satisfied with the selection and transitions, clicking on the Make button automatically generates a slide-show screen saver on your hard disk or a runtime module on floppy disks. The images are compressed and saved in .BMP format; you can save to multiple floppy disks if necessary.

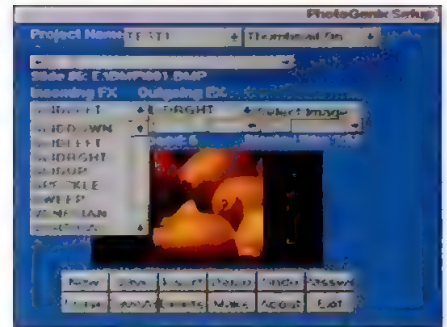
Unfortunately, the process of assembling and editing a screen-saver show isn't trouble-free. PhotoGenix has no image-editing or text-adding capability, so

you'll have to perfect your images in Adobe Photoshop for Windows or some other image-editing package first. Although PhotoGenix can display a single thumbnail or preview a single image, it cannot show multiple thumbnails or run a preview with all the images. Also, the slider bar on the time line doesn't work in reverse. And when compiling the runtime module, you may receive a message reporting a bad floppy disk (even though it's good); this causes the entire

process to abort. Don't look to the sparse 14-page documentation for help, although the company does provide phone and fax support.

PhotoGenix is a stunted execution of an excellent concept. Despite the program's flaws, if you're willing to put in a little extra effort, you can create an attractive slide show promoting or advertising your company's products or services.

► **PhotoGenix.** List price: \$149. Requires: 4MB RAM, 1MB hard disk space, Microsoft Windows 3.x; CD-ROM



SEQUENCE: PhotoGenix has 15 built-in effects for smoothing the transition between the images in your slide show.

drive optional. Firefly Software Corp., P.O. Box 756, Jericho, NY 11753; 800-224-2778, 516-935-7060; fax, 516-932-7905.

Circle 401 on reader service card

■ Windows Utilities

The Power Utility Pak Adds Power to Excel

BY CRAIG STINSON

The Power Utility Pak (PUP) is a set of 17 utilities that enhance and extend the prowess of Microsoft Excel 5.0, taking the already capable spreadsheet program to a higher level. Like the similar Baarns Utilities (First Looks, May 17, 1994), the \$39.95 PUP program attaches itself to Excel's menu bars and context menus, and presents a custom toolbar for easy access to each utility. But unlike the Baarns set, the PUP modules may be loaded and unloaded individually on demand.

Those who work with many files at once will appreciate PUP's Batch Print tool, which allows you to gang-print a multiple selection of worksheets, charts, and modules. A Quiet Mode option prints without loading files visibly into memory, and there is an Unattended Mode option that suppresses update prompts for files con-

taining links.

Five of the utilities address temporal issues. Insert-A-Date enters any date into the current cell, in virtually any format you choose. Reminder Alarm provides wake-up calls. Time Tracker maintains four separate stopwatches, for those who bill their spreadsheet work by the hour. Date and Time displays the current date and time in a message box. There is also a Perpetual Calendar that displays a calendar for any month

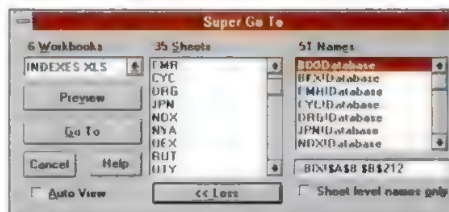
lets you preview any item or jump to it with a click of the Go To button. On the other hand, PUP's Workbook Contents utility essentially duplicates the list that Excel provides when you right-click the VCR controls at the bottom of a workbook window, and the Interactive Zooming tool does little more than Excel's zoomer feature.

The remainder of PUP includes Text Tools, a utility for making batch modifications to label cells; a Select by Value utility that builds a multiple selection based on a numeric criterion; a Calculator for those who simply can't give up the ten-key pad; the inevitable sticky note tool; two utilities for adjusting the positions of graphic objects; and a handy Save with Backup tool that stores a copy of the current workbook in a separate directory without changing the Excel directory.

All told, the Power Utility Pak starts where Excel leaves off, providing extra functionality and useful shortcuts.

► **Power Utility Pak.** List price: \$39.95 (\$59.95 with VBA source code). Requires: Microsoft Excel 5.0. Jwalk and Associates, 8726 Villa La Jolla Dr. #80, La Jolla, CA 92037; 800-242-4475.

Circle 402 on reader service card



JUMP: The Super Go To feature allows you to switch to any worksheet, chart, or module—or just preview it.

from 1900 to 2078.

The Super Go To utility presents a list of all your worksheets, charts, modules, and dialog sheets, as well as all defined names on all open workbooks; it

"Have you looked under your desk recently?"

- Steve Bass, PC WORLD
"Hot Picks for the Home
Office" article, June 1994.

Introducing PowerManager™ with cord management capabilities!

Chances are, you've got a jungle of power cords under your desk that need to be tamed. As PC WORLD says, "...it's time

to round up that mass of coils with [APC's] PowerManager™. Just slide back

the cover, and you've got a place to safely and neatly store equipment power cords. PowerManager also has a customizable front panel that you can tailor to your own system configuration and a convenience outlet for charging of laptops or other desktop needs.

With a single touch, you can power-up as many as five peripherals in your multimedia or similar system, right from your desktop. PowerManager also offers the highest level of surge protection. We guarantee it! Under APC's Lifetime Equipment Protection policy, we'll repair or replace up to \$25,000 worth of properly connected equipment if it's ever damaged by a spike, surge or lightning strike. And, with its lifetime product warranty, PowerManager will be the last control center you'll ever have to buy!



So, take control! Call APC toll-free for more information at (800)800-4APC, or call our literature PowerFax

system to have a spec sheet automatically sent right back to you: (800)347-FAXX.



APC
AMERICAN POWER CONVERSION

(800)800-4APC Dept. E4
132 Fairgrounds Road, W. Kingston, RI 02892
CompuServe: GO APCSUPPORT
Internet: tech@apcweb.UUCP or usenet@apcweb.us

■ Electronic Publishing

SmarText Breathes Life into Your Words with HyperLinks

BY DAVID HASKIN

Although electronic distribution of corporate documents such as policy and procedure manuals or internal newsletters is faster and often cheaper than publishing them on paper, the awkwardness of the tools used to do this have discouraged many companies. With Release 3 of its \$495 SmarText, Lotus makes it easier to create electronic books that are text-oriented and hyperlink-rich, thereby upping the appeal of electronic publishing.

In this update, Lotus added basic multimedia support and made SmarText's electronic books more customizable, but the basics remain the same: You start in the authoring module by linking SmarText to documents created by other applications. SmarText doesn't import the source documents; it creates links that allow you to view them.

INDEXES AND OUTLINES

SmarText supports various versions of Microsoft Word (but not Word for Windows 6.0), WordPerfect, and Lotus Ami Pro. You can use your word processor to modify the contents of an electronic book and SmarText will automatically update it afterward. This provides a significant publishing speed advantage over traditional printing.

New in this version is the ability to format text directly in SmarText without altering the source document. Also new is the ability to view tables created in source word-processing documents, a capability sorely lacking in previous versions.

After adding the text, SmarText lets you generate an index of the document and an outline.

These are electronic versions of the traditional index and table of contents; they give the reader the ability to double-click on a reference in the outline or index to jump directly to the item in the main body of the text.

By default, SmarText creates the index by selecting words that appear frequently and are not excluded in a special stop list. You also can base the index on a keyword file you create, but you can't base it on an index created in the source documents.

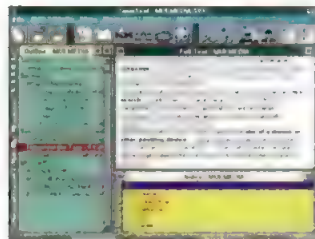
SmarText bases its outline on section headings in the source document. However, you can optionally create outlines based either on various formatting styles or on a table of contents in the source document. Also, as with indexes, you can manually designate your own outline entries.

SmarText is reasonably speedy at creating electronic book files, indexes, and outlines. In a test document with about 100K of Word for Windows source files, creating the initial electronic book file and the index each took about 3 minutes on a 486DX/33 with 16MB of RAM. Creating the outline took less than a minute.

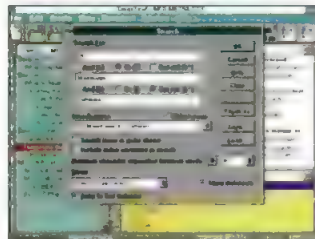
HYPERLINKS

Besides using outlines and indexes, you can find information with SmarText's text-retrieval capabilities. A dialog box walks users through the creation of searches using Boolean AND, OR, NOT expressions. SmarText displays search results in a window and, if you double-click on a found term, SmarText takes you to that location in the text window.

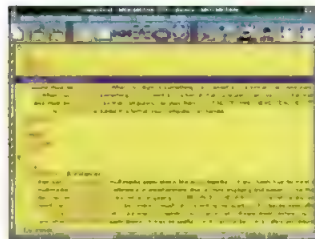
Unlike other products in this category, SmarText creates hyperlinks automatically. By



SMARTTEXT: The basic screen shows the full-text, index, and outline views of a document.



SEARCH: You have full-text search capabilities from this dialog box.



EXPAND: You can expand the index to show all the references to an indexed word in the document.

default, SmarText creates hyperlinks between indexed words in sequential order throughout the document. You also can choose specific words to be linked. A slider bar determines the relative number of hyperlinks that SmarText creates.

On our tests, the quality of the automatic hyperlinks varied—some links were logical and useful, others weren't. Still, most people will find that refining automatically generated links is

faster than the usual process of creating links manually.

SmarText provides two other types of hyperlinks. Application links launch a specific program when you double-click on a word. Interestingly, you can create an application link to specific topics in another program's Windows help system, making SmarText an excellent tool for software training applications. Global links connect all mentions of a single word or phrase to a single location. This lets you link all occurrences of a term to a definition or illustration of that term.

Previous versions allowed you to insert images into SmarText, but this version's OLE 1.0 support enables you to embed videos, animations, and sounds. You do this by copying the object from the source application and pasting it into SmarText. This method is clumsy for creating interactive presentations, but since electronic books are most typically used for text-oriented reference works, this shortcoming shouldn't be a problem.

After creating the application, you can distribute it with an extra-cost (\$99) but royalty-free reader, which can be customized extensively. For example, authors can create custom toolbars and menu structures to distribute with their electronic books.

Overall, creating electronic books with SmarText is as simple as using a word processor, and SmarText provides powerful tools to help users find the precise information they need. This combination of power and simplicity makes electronic publishing a worthwhile idea.

► **SmarText, Release 3.** List price: *Authoring module*, \$495; *reader*, \$99. Requires: 4MB RAM, 5MB hard disk space; Microsoft Windows 3.1 or later. Lotus Development Corp., 1000 Abernathy Road, #1700, Atlanta, GA 30328; 800-831-9679, 404-391-0011; fax, 404-698-7653.

Circle 439 on reader service card

DeskPorte **FAST** Earns
TOP SCORE
In PCWeek Labs
"First Looks"
11/29/93

"Our latest breakthrough in high-speed

communications is low prices."

THERE'S A CONCEPT!

Ali Bigdeliazari,
Director of Sustaining Engineering,
Microcom

WHY BUY A 14,400 bps MODEM WHEN YOU CAN GET A MICROCOM 28,800 FOR \$299.

Microcom modems already give you the fastest speeds and highest reliability in the industry. Now we've added another powerful advantage: unbeatably low prices.

Take our DeskPorte **FAST** ES 28.8. For only \$299, it delivers twice the speed of 14,400 bps modems, with throughput rates of 115,200 bps. A great all-purpose modem for DOS, Windows and Unix.

For Windows users, our DeskPorte **FAST** EP 28.8 is a terrific deal at just \$399. Using Microcom's innovative parallel port technology, it achieves sizzling speeds: up to 300,000 bps throughput without loss of data.



MicroWAREHOUSE

1-800-367-7080

PC Connection

1-800-800-4396

EGGHEAD SOFTWARE

North America's Software Eggheads.

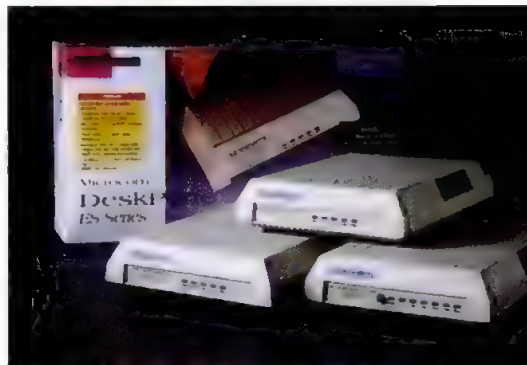
And if you want outstanding value in a full-featured V.32bis modem, put our \$239 DeskPorte ES 14.4 at the top of your list. It delivers throughput rates of 57,600 bps. And connects with a wide variety of modems now in use.

Each model features full MNP[®] 10 (Microcom Networking Protocol[™] Class 10) support.* That's the standard we developed for sure-fire connectivity under all line conditions. The 28.8 units employ Rockwell V.FC technology. And all three come with 14,400 bps fax software plus a free 5-year warranty.

So if you thought price might keep you from moving up to a Microcom modem — think again.

For more information, see your Microcom dealer; for a free modem info kit, call Microcom at

1-800-822-8224



microcom

The brightest ideas in remote access.

Microcom, Inc. 500 River Ridge Drive, Norwood, MA 02062-5028
Phone 617-551-1000 • Fax 617-551-1021

*DeskPorte **FAST** ES 28.8 implements MNP 10 through 14,400 bps.

Microcom and MNP are registered trademarks and DeskPorte is a trademark of Microcom Systems, Inc. All other trademarks are the property of their respective trademark holders.

Windows Utilities

QAPlus/WIN Helps You Through Good Times and Bad

BY MIKE HOGAN

Personal computer productivity is governed as much by the laws of Murphy as by the laws of physics. Law No. 1: Your likelihood of experiencing a system failure and a cryptic message concerning EMM386 Exception error #06 increases in direct proportion to your need to compute that day. DiagSoft's QAPlus/WIN 6.0 (\$99.95), goes far to repeal the most onerous of Murphy's PC Laws by keeping you well-informed about

your computer's condition, warning you of impending failures, and helping you pick up the pieces.

QAPlus/WIN will detail the effects of every change in your computer's hardware or software so that you can assess the potential for disaster by launching either a quick test on a representative sampling of critical subsystems or a more exhaustive test suite. If something's amiss, a set of big, readable icons lets you dig deeper into the system.

Like its competitors, QAPlus/WIN is sometimes victimized by Microsoft Windows' penchant for masking hardware. For example, the program didn't report the existence of a SCSI drive on one test system (even though the program was loaded on that drive) because of Windows crashes during the testing of some SCSI drivers and IRQs. Stacked drives not referenced in CMOS are another challenge to QAPlus/WIN's integrity.

In general, though, QAPlus/WIN outdoes its competitors in its ability to test IRQ settings and RAM from within Win-

dows. You can print all test results along with DOS, Windows, and CMOS parameters at the click of a single icon or archive the information in

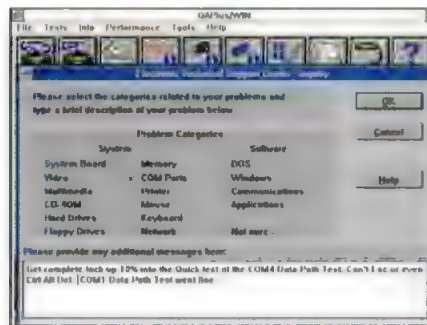


DIAGNOSE: QAPlus/WIN presents a wide array of tests on every aspect of your PC's hardware and system software.

spreadsheet or database format.

Included with QAPlus/WIN is a copy of CoSession remote software, which lets a DiagSoft

technician peek into your system over the phone. Click the phone icon and you are prompted for a quick description of your problem, which is then transmitted to



FIX: If your PC fails a test, send an electronic call for help from QAPlus/WIN's technical support module.

DiagSoft along with critical system information. You can ask for a return phone call, fax, or e-mail or go immediately into

the technical support queue. Three phone consultations are included in the price of the software, with additional support available at \$2 per minute.

You'll also appreciate Version 6.0's rescue disk of DOS tools and critical system and Windows files.

The one place QAPlus/WIN falls short is its help system, which isn't as helpful as its vastly improved interface. However, QAPlus/WIN is the best place to start building a well-tuned PC.

► QAPlus/WIN. List price: \$99.95 (up-grade, \$39.95). Requires: 2MB RAM, 3MB hard disk space, VGA graphics, Microsoft Windows 3.x (2,400-bps or faster modem for remote diagnostics) DiagSoft, 5615 Scotts Valley Dr. #140, Scotts Valley, CA 95066; 800-342-4763, 408-438-8247; fax, 408-438-7113.

Circle 421 on reader service card

Security

VoiceLock Seals Off Your PC

BY LEE SCHLESINGER

VoiceLock is an innovative program that limits user access to a PC by requiring not a password, but a voice match.

VoiceLock works with any sound card and limits access in two ways. The program can automatically encrypt directories when exiting Microsoft Windows and decrypt them to an authorized user's voice when entering again. When encrypted, the files are hidden from the Windows File Manager and the DOS DIR command. The program also locks the system when the PC's screen-saver program kicks in; only the specified voice will open it.

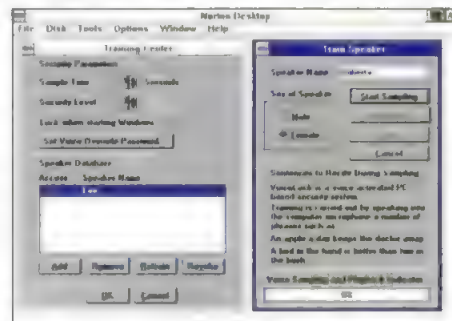
To get it to work, you'll have to train VoiceLock. This is as simple as reading a few sentences into a microphone. When

you've finished training it, the program will produce a voice-print. VoiceLock then displays a special security screen and plays a .WAV file instructing you to proceed by speaking into the microphone. Authentication takes just a few seconds. If your voice is verified, you're in; if not, the screen saver stays on.

The system's voice recognition works fairly well. We could fool it into thinking that we were not an authorized user, but when we spoke normally, VoiceLock always recognized us—even after we switched microphones. Overall, VoiceLock is a good

way to say no to unauthorized PC entry.

► VoiceLock 1.04. List price: \$79.95. Requires: 30K RAM, 2MB hard disk space, math coprocessor, sound board,



SPEAK: VoiceLock's training center is the first step to logging your voice print in the program's database.

microphone, Microsoft Windows 3.1 or later. QVoice Inc., P.O. Box 645, Andover, NJ 07821; 201-786-6878; fax, 201-786-5868.

Circle 422 on reader service card

STATISTICA/w

Windows,
DOS, Macintosh

STATISTICA/w™ (for Windows) Complete Statistical System with thousands of on-screen customizable, presentation-quality graphs fully integrated with all procedures ■ Complete Windows 3.1 support, DDE, OLE, TT-fonts, multiple toolbars, right mouse button support ■ Unlimited numbers of data-, results-, and graph-windows ■ Inter-window integration: data, results, and graphs can be treated as objects and converted into one another in a number of ways ■ The largest selection of statistics and graphs in a single system; comprehensive implementations of: Exploratory techniques; multiway tables with banners (presentation-quality reports); nonparametrics; distribution fitting; multiple regression; general nonlinear estimation; stepwise logit/probit; general ANCOVA/MANCOVA; stepwise discriminant analysis; log-linear analysis; factor analysis; cluster analysis; multidimensional scaling; canonical correlation; item analysis/reliability; survival analysis; time series modeling; forecasting; lags analysis; quality control; process analysis; experimental design (with Taguchi); and much more ■ Manuals with comprehensive introductions to each procedure and examples ■ Hypertext-based Stats Advisor expert system ■ Extensive data management facilities (spreadsheet with long formulas, block operations, advanced Clipboard support, DDE hot links, relational merge, data verification, powerful programming language) ■ Batch command language and macros also supported, "turn-key system" options ■ All output displayed in Scrollsheets™ (dynamic, customizable, presentation-quality tables with toolbars, pop-up windows, and instant 2D, 3D and multiple graphs) ■ Extremely large analysis designs (e.g., correlation matrices up to 32,000x32,000, unlimited ANOVA designs) ■ Megafile Manager with up to 32,000 variables (8 Mb) per record ■ Unlimited size of files; extended ("quadruple") precision; unmatched speed ■ Exchanges data and graphs with other applications via DDE or an extensive selection of file import/export facilities ■ Hundreds of types of graphs, including categorized multiple 2D and 3D graphs, matrix plots, icons, and unique multivariate (e.g., 4D) graphs ■ Facilities to custom design new graphs and add them permanently to menu ■ On-screen graph customization with advanced drawing tools, interactive stretching and resizing of complex objects, interactive embedding of graphs and artwork, special effects, icons, maps, multi-graphics management, page layout control for slides and printouts; unmatched speed of graph redraw ■ Interactive rotation, perspective and cross-sections of all 3D and 4D graphs ■ Extensive selection of tools for graphical exploration of data: fitting, smoothing, overlaying, spectral planes, projections, layered compressions, marked subsets ■ Price \$995.

Quick STATISTICA/w™ (for Windows) A comprehensive selection of basic statistics and the full graphics capabilities of STATISTICA/w ■ Price \$495.

STATISTICA/dos™ (for DOS) A STATISTICA/w-compatible data analysis system ■ Price \$795.

Quick STATISTICA/dos™ (for DOS) A subset of STATISTICA/dos statistics and graphics ■ Price \$295.

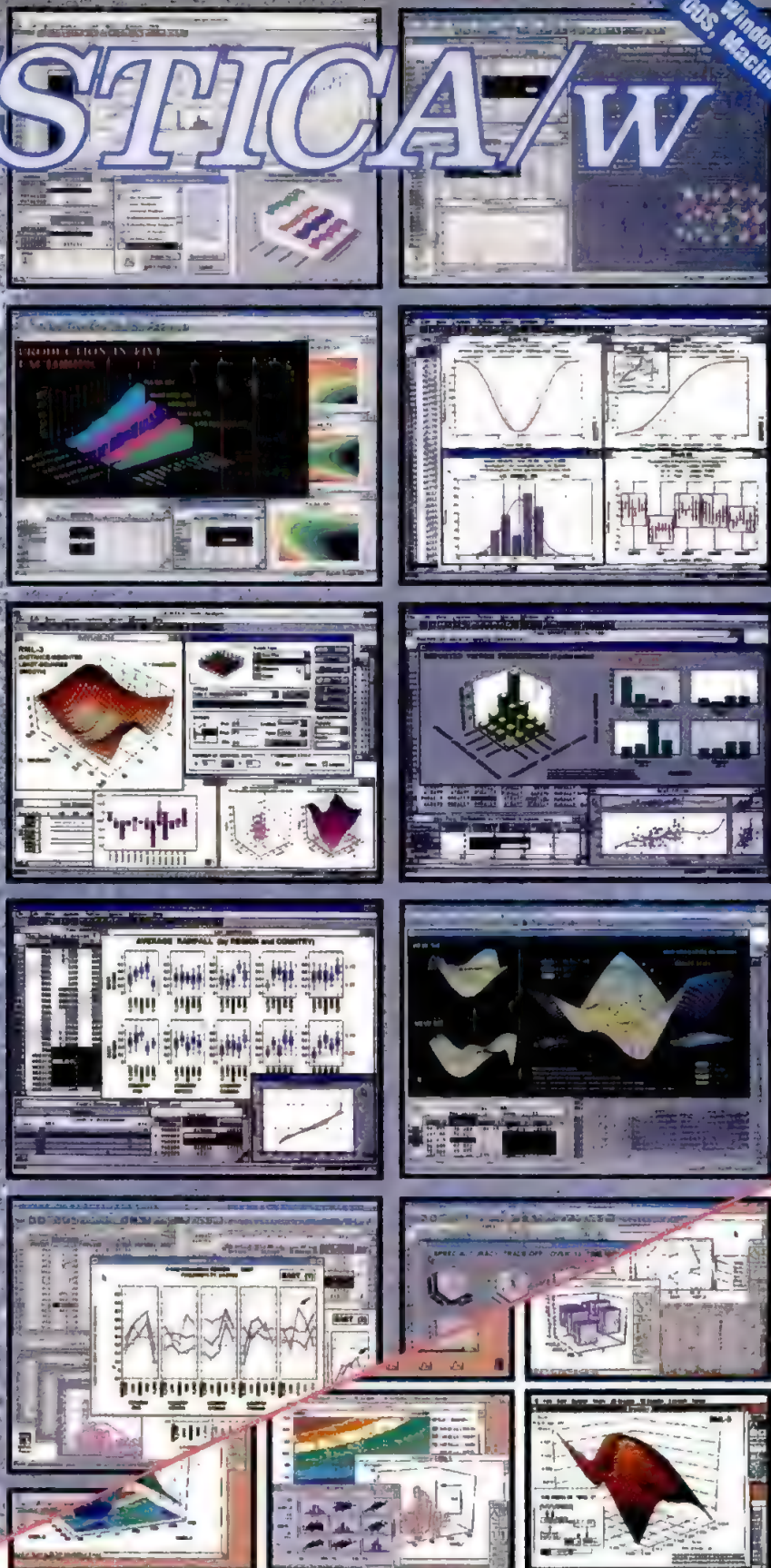
Domestic sh/h \$10 per product; 14-day money back guarantee.

CIRCLE 057 ON READER SERVICE CARD
StatSoft™

325 E. 13th St. • Tulsa, OK 74104 • (918) 583-4149
fax: (918) 583-4376

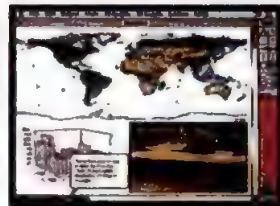
Foreign Offices: StatSoft of Europe (Hamburg, FRG) ph 040/4200347, fax 040/4911310, StatSoft UK (London, UK) ph 0462/482822 fax 0462/482855 StatSoft France ph (1) 45 66 97 00 fax (1) 66 06 51 StatSoft Pacific (Australia) ph (03) 563 5580 fax (03) 563 6117. Available from other authorized Representatives worldwide: Sweden: ph 018-240035, fax 018-210039; Finland: ph 24-4678, fax 24-333867; Belgium: 10 61 16 28; South Africa: 12-663-4500; Japan (Macintosh) ph 03-3770-7600, Japan (Windows) ph 03-3667-1110

StatSoft, STATISTICA/w, Quick STATISTICA/w, STATISTICA/Mac, Quick STATISTICA/Mac, STATISTICA/DOS, Quick STATISTICA/DOS and Scrollsheet are trademarks of StatSoft, Inc.



STATISTICA/Mac™ (for Macintosh) A STATISTICA/w-compatible, comprehensive data analysis and graphics system designed for the Macintosh ■ Large selection of statistical methods fully integrated with presentation-quality graphics (incl. EDA, multiplots, a wide selection of interactively rotatable 3D graphs; MacDraw-style tools) ■ Unlimited size of files ■ Full support for System 7, incl. "Publish and Subscribe" ■ Price \$695.

Quick STATISTICA/Mac™ (for Macintosh) A subset of STATISTICA/Mac, a comprehensive selection of basic statistics and the full graphics capabilities of STATISTICA/Mac ■ Price \$395.



Look for us on all the major networks.

Word about PCs from Hewlett-Packard is getting around, and ratings are soaring. According to a recent CRN/Gallup survey, "Use of HP desktops in Fortune 1000 companies has doubled in the last year."

And with good reason. Our broad range of PCs not only meets users' expectations for power and ease of use, it also answers the needs of a network manager. With built-in features like on-board networking, advanced security and asset tracking, HP PCs have what it takes to be top performers on virtually any network. And soon our expertise in network management will reach all the way to the desktop, as we continue to pioneer the development of DMI (Desktop Management Interface).

For more information or the name of your nearest HP dealer, call us today at 1-800-322-HPPC, Ext. 8567. And tune in to the network superstars.

Give your other PCs something to look up to.

If you're connecting PCs to a network, scan this chart and you'll see it's time to hook up with HP.

STANDARD NETWORKING FEATURES	HP VECTRA XM2 PC	HP VECTRA M2 PC	COMPAQ DESKPRO/XE	DELL NETPLEX
Advanced Bus Architecture	PCI	VL		
Integrated Networking Interface	32-bit	16-bit		
Integrated, multiprotocol Boot-ROM	X	X		
ISA Plug-n-Play Compliant	X	X	X	
Multilevel Security Features	X	X	X	X
Asset tracking	X	X	X	
PC tattooing	X	X	X	
Optional Desktop Management Software	X	X		
Bi-directional parallel port	X	X	X	X
Desktop Management Interface (DMI) ¹	X	X		



**HEWLETT®
PACKARD**

**HP quality in
value-priced PCs.**

- Intel 486SX, 486DX2 and DX4
- Chip upgrades to higher performance
- On-board accelerated local-bus video
- 210-MB hard drive¹
- 4-MB RAM, expandable to 64-MB
- 512 KB or 1 MB of Video RAM standard
- ISA Plug-n-Play compliant
- Desktop Power Management
- EPA Energy Star certified

**High-performance
network-ready PCs
in a slimline package.**

- Intel 25- and 33-MHz 486SX, 50- and 66-MHz 486DX2, upgradable to Pentium OverDrive
- Optional 128- or 256-KB second level cache
- 170-MB, 14-ms Fast-IDE hard drive¹
- 32-bit Fast-IDE local-bus hard disk interface
- 4- or 8-MB RAM, expandable to 96-MB
- Ultra VGA2 local-bus accelerated video supporting up to 1280 x 1024 resolution

**High-performance
PCs for the
connected office.**

- Intel 33-MHz 486SX, 50- and 66-MHz 486DX2, 100-MHz DX4, upgradable to Pentium OverDrive
- Optional 128- or 256-KB second level cache
- Four mass storage shelves; four expansion slots
- One available 32-bit VL-bus slot
- 210-MB, 14-ms Fast-IDE hard drive¹
- 32-bit Fast-IDE local-bus hard disk interface
- 8-MB RAM, expandable to 96-MB

**Exceptional 486
performance for advanced
business use.**

- Intel 50- and 66-MHz 486DX2, 100-MHz DX4, upgradable to Pentium OverDrive
- PCI architecture
- Standard 256-KB second level write-back cache
- Four mass storage shelves; four expansion slots
- Two available 32-bit PCI expansion slots
- 210-MB, 14-ms Fast-IDE hard drive¹
- 32-bit PCI IDE hard disk interface

**The ultimate PC for
advanced business and
technical applications.**

- Intel 90-MHz Pentium Processor
- Second processor socket for MP Spec 1.1 multi-processing
- Standard 256-KB second level asynchronous or burst asynchronous write-back cache
- PCI architecture
- Four mass storage shelves (three front accessible); five expansion slots
- Two available 32-bit PCI expansion slots
- 270-MB, 12-ms Fast SCSI-2 hard drive¹



HP Vectra VL2

- Local bus Fast-IDE hard disk interface^{*}
- 1280 x 1024 video resolution^{*}
- Optional 128- or 256-KB cache memory^{*}
- Free three-year limited warranty for parts and labor²



HP Vectra N2

- 1 MB of video RAM standard, expandable to 2 MB
- Slimline package with two mass storage shelves and three ISA slots
- Optional integrated 10Base-T networking
- Multilevel security
- EPA Energy Star certified
- ISA Autoconfiguration utility (Plug-n-Play)
- Integrated Desktop Management Interface (DMI)³
- Free three-year limited warranty for parts and labor²



HP Vectra M2

- Ultra VGA2 local-bus accelerated video supporting up to 1280 x 1024 resolution
- Optional integrated 10Base-T networking
- Systems Diagnostics Utility
- EPA Energy Star certified
- ISA Autoconfiguration utility (Plug-n-Play)
- Integrated Desktop Management Interface (DMI)³
- Free three-year limited warranty for parts and labor²



HP Vectra XM2

- 8-MB RAM, expandable to 96-MB
- PCI Integrated 64-bit S3 Vision-864 graphics accelerator supporting up to 1280 x 1024 resolution
- Optional PCI Integrated 32-bit 10Base-T networking
- Integrated Desktop Management Interface (DMI)³
- EPA Energy Star certified
- Free three-year limited warranty for parts and labor²



HP Vectra XU

- Integrated 32-bit PCI SCSI-2 interface
- PCI Integrated 64-bit S3 Vision-864 graphics with 1280 x 1024 resolution or PCI MGA Ultima Plus graphics with up to 1600 x 1200 resolution
- 32-bit PCI IDE hard disk interface
- 8 or 16 MB of RAM, expandable to 256 MB
- PCI Integrated 32-bit 10Base-T networking
- Integrated Desktop Management Interface (DMI)³
- Free three-year limited warranty for parts and labor²

from
\$1,099¹

from
\$1,309¹

from
\$1,679¹

from
\$2,239¹

from
\$3,749¹



All HP Vectra PCs come with MS-DOS® 6.2 and MS Windows for Workgroups 3.11 pre-installed, HP mouse and keyboard included. *Feature included with some models. ¹U.S. list price, dealer prices may vary. Monitor not included. ²Other capacities available. ³First year on-site, 24-hour service. Second and third year remote to dealer. ⁴Available 10/1/94. With permission CRN/Benchmark. MS-DOS is a U.S. registered trademark and Windows is a trademark of Microsoft Corporation. Pentium and the Intel Inside logo are U.S. trademarks of Intel Corporation. PPG407 ©1994 Hewlett-Packard Company

WE APPRECIATE YOUR HELP IN MAKING WINDOWS™ EASIER TO USE.

WE ALSO APPRECIATE YOUR CONTINUED HELP IN USING OUR TRADEMARK CORRECTLY.

For years we've listened to PC users like you suggest how to improve the Microsoft® Windows® operating system. And thanks to your help Windows just keeps getting easier to use.

But don't take our word for it. Ask the more than 50 million people worldwide using Windows to make their everyday tasks easier. Or the millions more expected to migrate to Windows when we release the next version which is even easier to use.

With so many users, it's understandable why we at Microsoft, the

company that makes Windows, want to protect the value of our trademark.

The Windows trademark is a simple way to identify our operating systems. It lets customers easily spot genuine Windows and Windows-compatible products.

So it's important for you to use the Windows trademark correctly.

For instance, compatibility with Windows should be noted with phrases such as "for use with," "compatible with," or "for Windows." Windows should not be used as part of a product name.

By helping us protect our Windows trademark, you'll help ensure the quality and value of the Windows operating system.

Thanks for your help. To learn more about the correct way to use our Windows trademark, call the Microsoft Sales Fax Service at (800) 727-3351 and request document 10000250. We'll fax you a free brochure.

The Microsoft logo, featuring the word "Microsoft" in a bold, sans-serif font.

New & Improved

NEWS OF ANNOUNCED PRODUCTS AND UPGRADES

By Adam A. Hicks

NEW

Spotlight Your Presentations

Software Publishing Corp. saw the need for a presentation add-in that would let you customize the way you deliver your presentations. Its solution is **Harvard Spotlight for Windows**, which sits on top of popular presentation packages to give you a way to effectively present, organize, and rehearse on-screen presentations. The software acts as a control panel for Harvard Graphics, Freelance Graphics, and PowerPoint presentation software. It allows for two screens: an audience screen and a presenter's screen. Other features include a timing device, a speech-coaching tool, and a slide manager that lets you jump between slides on the fly.

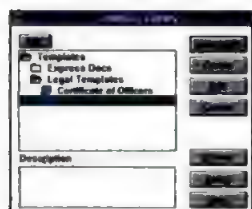
► **Harvard Spotlight for Windows.** List price: \$129. Software Publishing Corp., 3165 Kifer Rd., Santa Clara, CA 95056. 800-234-2500, 408-986-8000; fax, 408-980-0729.

Circle 404 on reader service card

IMPROVED

HotDocs 2.0: Instant Templates

HotDocs, from **Capsoft Development Corp.**, lets you create custom templates—complete with data-entry screens—for Microsoft Word, WordPerfect, and Lotus Ami Pro word processing documents without learning programming. **HotDocs 2.0** lets you copy and paste scripted elements between templates to save time. For easier management, you can organize templates into folders instead of scrolling through lists of names. You can link files while building a **HotDoc** template, which will help if you need



HotDocs' new library feature helps you manage related templates.

to keep data updated in multiple files but don't want to have to rekey updates multiple times. An optional ODBC-compliant database module (\$49) generates documents directly from a database. ► **HotDocs 2.0.** List price: \$99; upgrade price, \$39.95. Capsoft Development Corp., 732 East Utah Valley Dr., #400, American Fork, UT 84003; 801-763-3900; fax, 801-763-3999. Circle 405 on reader service card

Photography by Thom O'Connor

HOT
PROSPECT



For Color Printing, Not All Paper Is Created Equal

Since prices have dropped for color printers, a new market exists for paper companies that produce specially coated paper and transparency films. One example is **Rexham Graphics' Presentation Series** of paper and films—tailored for the different ways in which your ink jet, laser, and thermal-transfer printers put color on the page. Rexham even offers toll-free phone support for color printing advice and troubleshooting.

The ink jet papers are coated to compensate for running, bleeding, and inconsistent color saturations that can occur as ink jet nozzles spray electrically charged ink droplets onto the page. Thermal-wax printing requires a smooth coated surface so that melting wax bonds evenly to the page. Rexham also plans a line of paper for use with laser printers. Coatings also provide paper with protection against the heat and humidity generated during printing that can cause plain paper to wrinkle and curl.

Each line consists of papers, transparencies, and white film priced according to size, number of sheets, and printer model. Buying the paper from companies like Rexham gives you an alternative to buying paper from your printer manufacturer.

► **Rexham Presentation Ink Jet Series.** List price: \$20.95 to \$119.90. **Rexham Presentation Thermal Transfer Series.** List price: \$18.95 to \$97.90. Rexham Graphics, 28 Gaylord St., South Hadley, MA 01075; 800-628-8604, 413-536-7800; fax, 413-534-5071. Circle 420 on reader service card.

NEW

FreeMail Extends into a Routed E-Mail Family

Saroff Design has announced **FreeMail Extended Family** as an inexpensive alternative to a routed e-mail system. The new package works similarly to **FreeMail** (First Looks, page 44, June 28, 1994); you create a circle of e-mail users by starting with a parent disk that spawns child disks for you to distribute. The difference between **FreeMail** and the new **Extended** version is that **FreeMail** focuses on communications between parent and child (**FreeMail** children are limited to 400-character messages among each other). On the other hand, **Extended Family** children can communicate with the parent and with other children using features that include encryption, group addressing, file exchanges (of any size), call scheduling, and message forwarding. In effect, **Extended Family** creates a client/server e-mail routing center by using a single dedicated PC and single dedicated phone; this way, you can avoid the expense of sending e-mail through a service.

► **FreeMail Extended Family.** List price: \$595.95. Saroff Design, 1901 Missoula Ave., Missoula, MT 59802; 406-542-3867; fax, 406-549-7457.

Circle 406 on reader service card

NEW

Tatung's 15-Inch Monitor With Internal Speakers

Tatung Co. of America has done as Philips did, tucking internal speakers inside its 15-inch **Audio 15** monitor. This unit, which is priced comparably with monitors that have no speakers, is a 0.28-millimeter-dot-pitch monitor with a 13.8-inch-diagonal active-screen; it has a vertical refresh rate of 75 Hz at a maximum noninterlaced resolution of 1,024-by-768. The **Audio 15** monitor is Energy Star-compliant, has a front-mounted control panel, and allows you to save and recall settings—three features that were not found on the Philips **Brilliance 15**-inch monitor reviewed in our last roundup ("Through the Looking Glass," March 15, 1994).

New & Improved

► **Audio 15.** List price: \$499. Tatung Co. of America Inc., 2850 El Presidio St., Long Beach, CA 90810; 800-829-2850, 310-637-2105; fax, 310-637-8484.

Circle 407 on reader service card

IMPROVED

Sherlock Takes the Mystery Out of Naming Files

2010 Software Corp.'s Sherlock helps you get a handle on large numbers of Windows documents. The package takes over your Windows programs' Save and Open functions to let you save and recall files with 254-character Sherlock Cards instead of 8-character DOS names, and without ever leaving Windows 3.11 (this feature will be included in the upcoming release of Microsoft Windows 4.0, code-named Chicago). In the latest release—Sherlock, Version 4.0—files can be moved and copied by dragging and dropping. If you need all of the files from a particular project stored in a folder, Sherlock 4.0 will let you launch up to 32 documents across different applications. Sherlock is not a robust enterprise system, but the new version helps you manage documents stored on floppy disks and gives you user-definable fields to build custom databases. Previous versions of Sherlock were compatible only with NetWare, but Sherlock 4.0 adds compatibility with networks running under Microsoft Windows for Workgroups, LANtastic, or VINES.

► **Sherlock, Version 4.0.** List price: \$179; upgrade, \$49.95; 10-user pack, \$695. 2010 Software Corp., 611 Rte. 46 West, Hasbrouck Heights, NJ 07604. 800-952-2314, 201-288-7100; fax, 201-288-7274.

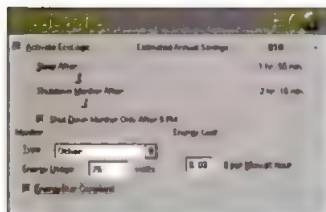
Circle 409 on reader service card

IMPROVED

EcoLogic Makes After Dark's Toasters Energy Conscious

The enormously popular screen saver from **Berkeley Systems** has come out with

another new version: After Dark, Version 3.0. This novelty item, which has turned toasters into cult computer icons, has lost none of its humor in Version 3.0 but adds a serious note of energy conserva-



The EcoLogic power-management system calculates the amount of annual energy bill savings.

BRIEFS

Hardware

Micro Solutions produces the Backpack line of parallel connected peripherals, which now includes the Backpack 3010 (\$599) quarter-inch-cartridge tape drive with a 340MB native capacity. The 3010 has a 9MB-per-minute transfer speed. The drive will read older QIC-40 and QIC-80 tapes but it writes only to the new QIC cartridges, which fit more tape into the same form factor, giving you greater storage capacity. 800-890-7227, 815-756-3411.

BCB Technology Group has released the DART-Assist PC-based digital voice recorder. The DART-Assist looks like a typical hand-held tape recorder with start, stop, and record buttons, but it makes a digital recording onto a PC's hard disk. The \$399 unit will operate for two hours on a 9-volt battery and uses a serial-port connector to attach to the PC. 800-263-9947, 905-850-8266

Boca Research has its own PCI-bus graphics accelerator card called the PCI SuperX VGA. The \$195 card uses the Cirrus Logic GD5430 chip set. The SuperX supports 256 colors at a resolution of 1,024-by-768 and true color at 640-by-480. The maximum resolution supported is 1,280-by-1,024 with 16 colors. 407-997-6227.

ALPS Electric (USA) is shipping a \$229 24-pin dot-matrix printer. The ALPS DMX180 will print up to 180 characters per second in draft mode and will print more slowly at resolutions of up to 360-by-360-dpi. The printer attaches via a parallel port. 800-825-2577, 408-432-6000.

ProTégé Corp. has stacked seven individual CD-ROM drives in one unit, for a total storage capacity of 4.5 gigabytes. The ProTower-7 (\$3,650 for a double-speed drive; faster drive speeds are available for an additional cost) works on systems running DOS, NetWare, OS/2, or Windows and can connect to a workstation, a server, or to a network directly. A SCSI enabler allows all seven drives to occupy a single SCSI ID address. 800-232-1347, 714-961-7000.

tion. Berkeley Systems has included a shut-down-or-sleep feature called EcoLogic, which will put Energy Star-compliant monitors to sleep or turn them off completely after specified time periods. In all, you'll find 15 new modules in this release, including You Bet Your Head (a humorous on-screen quiz show); RatRace (watch rodents go); and, of course, a new version of the famous Flying Toasters (who now have a marching theme song with a karaoke option). To keep things interesting, you can also combine modules or draw your own pictures and see them morphed together on-screen.

► **After Dark, Version 3.0.** List price: \$39.95. Berkeley Systems Inc., 2095 Rose St., Berkeley, CA 94709; 800-344-5541, 510-540-5535; fax, 510-540-5115.

Circle 410 on reader service card

IMPROVED

PictureTel Videoconferencing Doesn't Forget the Sound

Although everyone is eager to get full-motion videoconferencing, **PictureTel** has not forgotten that sound matters, too. Virtuoso is a package of audio enhancements that will be offered for PictureTel's videoconferencing products: the PictureTel System 4000, PictureTel System 1000, and PictureTel Live PCS 100. Two of the package's elements concentrate on sound balance; the automatic noise-suppression portion learns and filters background noise, while the automatic gain control adjusts volume. Meanwhile, the PT724 is a wideband audio-compression algorithm that saves your bandwidth for line-hogging video. There is also a dome-shaped tabletop microphone, called the PowerMic that can be purchased separately for \$1,000. The microphone distributes its listening sensors to maintain a constant volume as speakers change.

► **Virtuoso.** List price: As option for new system, \$4,000; integrated to an existing system, \$5,000 to \$8,000. PictureTel Corp., 222 Rosewood Dr., Danvers, MA 01923; 800-716-6000, 508-762-5000; fax, 508-762-5244.

Circle 411 on reader service card

NEW

Wavetable Sound from Tiptek

In our review of the Golden Sound Pro 16 FM synthesis sound card from **Tiptek**, we had found that while the features were impressive, the card's sound quality and implementation were lacking ("Big Audio Dynamite," April 12, 1994). The new Golden Sound Pro 16 Plus

FOR WINDOWS dBASE

The Future Is Here!

*Use what you already know
to get the most out of Windows.*

“I’m instantly an expert Windows developer. No other product gives me this much flexibility and power.”

Eric Breiter, Independent application developer

“This is the best front-end I’ve seen for a Client/Server environment.”

Mike Henneberry, Henneberry Consulting

“dBASE has gone way beyond its competitors by making it a lot easier to create objects, develop customized reports, and work with existing DOS data.”

Greg Greer, Harvard Community Health Plan

“This level of compatibility and flexibility is unmatched in the marketplace.”

Carl Hane, MCI Communications

dBASE for Windows redefines

● This changes everything without changing a thing

Get ready for an all-new dBASE.* Unmatched compatibility...yes! But it's much more. dBASE for Windows delivers many bold, new advances that help you create powerful Windows and Client/Server applications in record time. You get everything you need for the next generation of database application development.

▲ The promise of Rapid Application Development is fulfilled

You need a development environment that helps you get your job done fast. That environment is dBASE for Windows. Only dBASE for Windows provides the most complete set of productive tools and object-oriented extensions to the dBASE language to reduce development time. That includes unique Two-Way-Tools™ that let you work interchangeably between your visual design and dBASE source code. As you design forms, queries, and menus, dBASE for Windows automatically generates object-oriented dBASE code for you. You can edit the source code directly, and your changes are reflected instantly back in your visual design. As a result, you dramatically reduce the time required to develop Windows and Client/Server applications.

Only dBASE gives you everything you need to move to Windows and Client/Server in one step.

SpeedBar® icons let you perform common tasks with a single mouse-click.

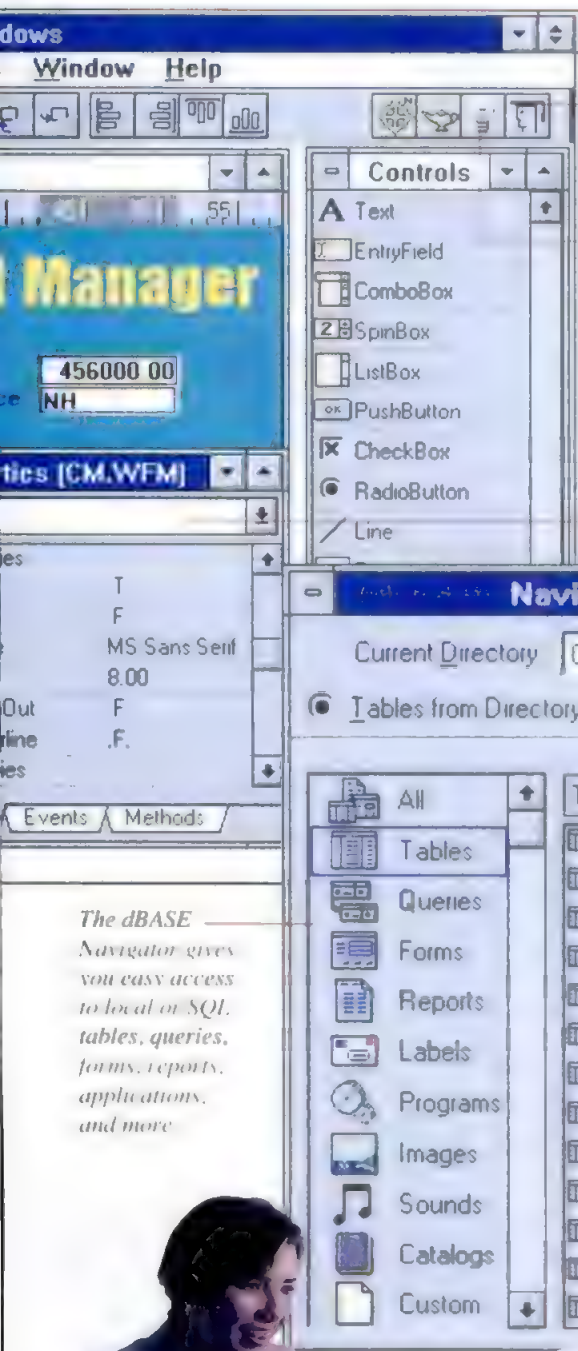
Create forms, menus, and dialog boxes in a snap with the Form Designer.



Build multi-table queries visually with the Query Designer. Use SpeedFilter™ technology to get results fast.

	dBASE	FilePro	Access	PowerBuilder
Compatibility with dBASE standard	Yes	No	No	No
Two-Way-Tools that resolve to code	Yes	No	No	No
Language supports full object model (OOP)	Yes	No	No	No
Full context-sensitive On-line Help	Yes	No	No	No
Experts/Wizards	Yes	Yes	Yes	No
Interactive Tutors work with "live" data	Yes	No	No	No
Design forms with "live" data	Yes	No	No	No
Property Inspection tool	Yes	No	Yes	No
Automatic multi-table forms and reports	Yes	Yes	Yes	No
Custom control usage	DLL,VBX, dCC	No	OCX	DLL,VBX
Directly calls the Windows API	Yes	No	No	Yes
Optimized for complex and network queries	Yes	No	No	No
Transparent access to local and SQL data	Yes	No	No	No
Use dBASE language to SQL server	Yes	No	No	No

Windows database development



Learn dBASE
easily with
Interactive Tutors

Create stunning forms
automatically with
the FormExpert

The Object Inspector
lets you modify
reusable objects with
a click of the mouse.

The dBASE
Navigator gives
you easy access
to local or SQL
tables, queries,
forms, reports,
applications,
and more



dBASE for Windows makes object-oriented development easy

You may have heard that object-oriented programming is difficult to learn. Not anymore.

One of the biggest breakthroughs is that dBASE for Windows makes it easy to learn object-oriented development. The Two-Way-Tools generate object-oriented code, so you learn object-oriented programming by simply using the visual designer.

dBASE for Windows also includes built-in objects that are ready to go. All the properties and procedures that define the object are already built for you. You can use Borland's unique Object Inspector[®] to instantly modify these reusable objects just by pointing and clicking with the mouse. Since you're working with proven, prebuilt components, you develop faster and create new applications that are more reliable, and more easily maintained. There's simply no better way to build Windows and Client/Server database applications.



1-800-336-6464, ext. 8939

Borland
The Upsizing Company

dBASE for Windows

● Open “Plug-and-Play” Architecture

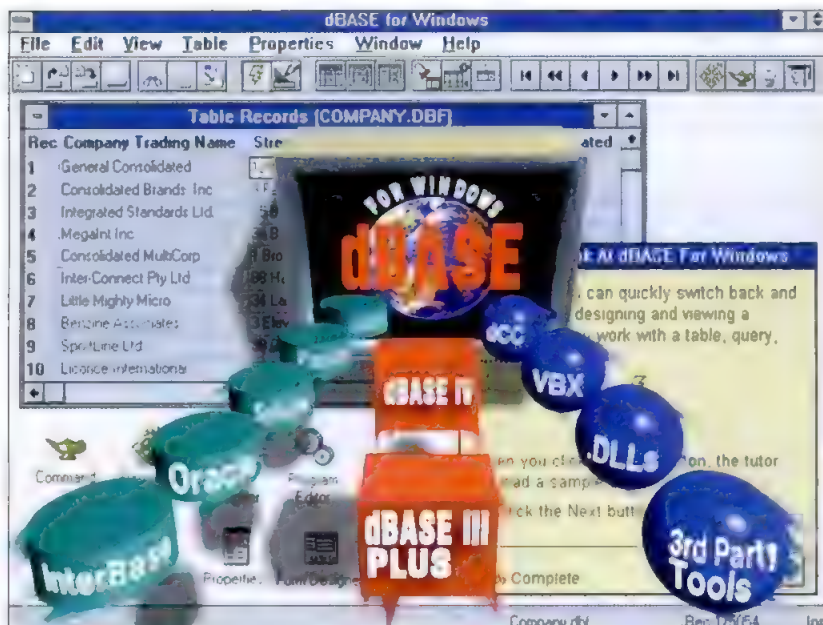
opens a world of opportunity

dBASE® for Windows is architected to allow you to “plug in” a full array of components to extend the power and functionality of your applications. Incorporate any kind of information—

data, sound, graphics, video, even entire applications as Object Linking and Embedding (OLE) objects. And with full access to the Windows API and the ability to call Windows

.DLLs, dBASE for Windows gives you incredible flexibility to mold the Windows interface to suit *your* design.

If you have VBX or other third-party controls, you can use them just like built-in objects in dBASE. Or you can create your own custom controls in the dBASE language. Once you plug them into dBASE, they work just like native controls. It all means that now dBASE developers can instantly plug in and add virtually any kind of functionality to their applications—spreadsheet, communications, graphics, you name it!



◀ With dBASE for Windows, you can plug in virtually any component, access local data and remote SQL data and leverage your dBASE for DOS knowledge to build great Windows applications in record time.

▲ Unmatched compatibility

fully leverages your investment in dBASE for DOS

If you have ever used dBASE, new dBASE for Windows will be the most comfortable and productive way to create and use database applications for Windows. Whether you want to create stunning forms and reports, or use information stored in remote databases, only dBASE for Windows gives you the tools you need...using knowledge you already have. Your investment is secure because programs created in dBASE for DOS can run in dBASE for Windows. You can even

use the new Component Builder™ to give your existing applications a new graphical look. And dBASE for Windows and dBASE for DOS can be run concurrently by different users on a network. Only dBASE for Windows can offer you this kind of effortless compatibility with dBASE for DOS.

Borland even offers a new version, dBASE 5.0 for DOS, for users who need to continue to support and extend their investment in DOS.

Also Available
New version dBASE 5.0 for DOS

All the power and functionality of dBASE IV, plus:

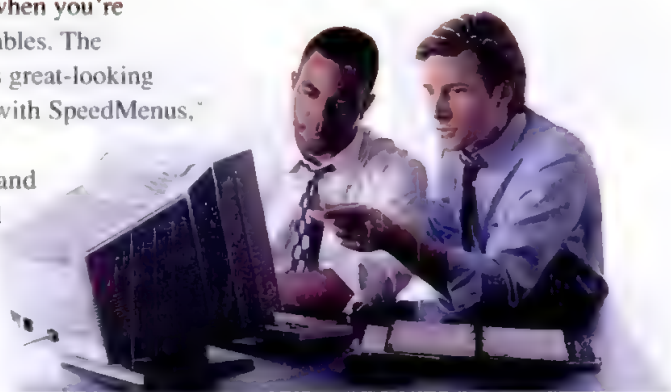
- Twice the performance of dBASE IV® v 2.0
- Developer's Desktop Integrated Development Environment (IDE)
- Integrated .EXE Compiler
- Two-Way-Tools that read and write source code
- Powerful event-driven and object models
- Full compatibility with dBASE III PLUS® and dBASE IV®

has the future built in

New visual tools for managing data *gets your work done fast*

dBASE for Windows takes full advantage of Windows. You can perform virtually any operation you want just by pointing and clicking with your mouse. The dBASE Navigator and Catalog Window let you view, organize, and access all your tables, queries, forms, reports, labels, programs, and related files. The new Visual Query Designer with SpeedFilter™ technology returns

answers fast, even when you're searching multiple tables. The FormExpert™ creates great-looking forms for you. And with SpeedMenus,™ Object Inspectors,™ Interactive Tutors™ and On-line Help, you'll be up and running, and seeing productivity gains right away.



Client/Server-ready when you are *gives easy, secure access to corporate data*

dBASE for Windows is the only database that provides a smooth transition into Client/Server computing. That's because we make it as easy to access and use remote SQL data as it is to use your local dBASE data. With dBASE for Windows, you use the same tools



and dBASE language to manipulate SQL data directly from Oracle, Sybase, MS-SQL Server, InterBase, Informix,™ ODBC,™ and DB2.™ There's simply no better or easier tool for "upsizing" PC and PC network applications to Client/Server.

* Available second half 1994

Upgrade Now!

The best way to build
Windows database applications.

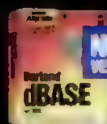
dBASE for Windows

\$199⁹⁵
UPGRADE



dBASE 5.0 for DOS

\$149⁹⁵
UPGRADE



dBASE Training Videos

- Learning dBASE for Windows **\$49⁹⁵**
- Developing with dBASE for Windows **\$49⁹⁵**



Your path from DOS to Windows and Client/Server is here. See your dealer or CALL NOW!

1-800-336-6464, ext. 8939

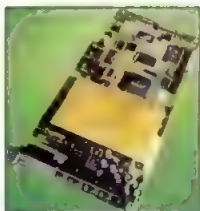
Fast Fax 1-800-488-0001 Developer Certification 1-800-353-2211 Canada 1-800-461-3327

CIRCLE 220 ON READER SERVICE CARD

Copyright © 1994 Borland International, Inc. All rights reserved. All Borland product names are trademarks of Borland International, Inc. Prices good in the United States and Canada only. All prices are in U.S. dollars. Dealer prices may vary. B1 7468

Borland
The Upsizing Company

New & Improved



The Golden Sound Pro 16 Plus sound card.

uses the Yamaha OPL-4 chip (as does Logitech's SoundMan Wave card) for wavetable synthesis, which provides more accurate sound for MIDI than does FM synthesis. The Plus version is a 16-bit sound card that has a built-in SCSI-2 CD-ROM interface and audio adapter. The Golden Sound Pro 16 Plus is competitively priced for wavetable synthesizing cards, and it supports the major sound standards.

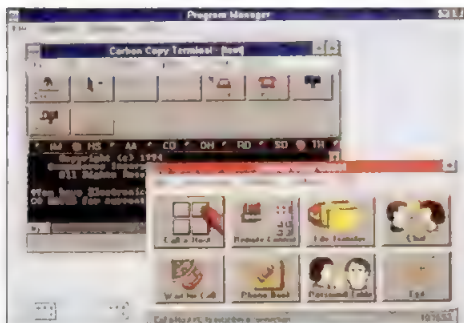
► **Golden Sound Pro 16 Plus.** List price: \$299. Toptek Technology Inc., 14140 Live Oak Ave., Unit C, Baldwin Park, CA 91706; 800-874-4425, 818-960-9211; fax, 818-960-0703.

Circle 412 on reader service card

IMPROVED

Carbon Copy 2.5 Adds Terminal Emulation and Comm Gateway

Microcom's Carbon Copy does not command nearly the market share of remote communications packages as Symantec's pcAnywhere and Traveling Software's LapLink. But what it does have going for it is a friendly inter-



Microcom's interface is still among the most user-friendly of remote communications software.

face; in addition, Version 2.5 offers enhanced functionality. Microcom added a 32-bit communications driver to enhance the performance of remote Windows communications driver operations. Carbon Copy, Version 2.5, also includes a terminal emulator (used for dialing in to information systems or BBSs), which contains a phone book and support for the standard transfer protocols. The new version also includes a communications gateway that you can use to set one modem for dial-in and dial-out use across the network. This feature can be useful for a small LAN, because it means that you won't have to dedicate a PC for dial-in

BRIEFS

Hardware

If the ProTower-7 isn't large enough for your storage needs **Eastman Kodak Co.** has released the Kodak Professional Library 30, which provides on-line access to 100 CDs, one at a time. The \$9,995 unit holds two magazines, each containing 50 CDs; a robotic arm, in conjunction with jukebox management software, rotates the CDs into the unit's double-speed drive. Kodak includes management software so that you can search through the 60GB of data by creating a searchable catalog and index. 800-242-2424 ext. 51, 716-724-6888

Software

AudioFile is shipping a retail version of its TalkWorks voice messaging software, which can now be found in the IBM Thinkpad Traveling Multimedia systems. TalkWorks 2.1 (\$59), which you can launch from your Windows toolbar without changing applications, adds voice annotation to files, presentations, and messages. The program can shrink audio at compression rates of up to 36:1, and it lets you do variable-speed playback and recording. 800-520-2834, 617-863-0890

Individual Software, creator of 12 computer-based training programs for popular Windows business applications (\$99.95, standalone; \$650, network) and suites (\$365, standalone; \$2,275, network), now includes Skill Assessment Software modules with their training packages. The SAS modules contain 60 to 80 questions that can be given before and after training. You can use the software to assess an employee's skills or to identify areas where the training software can be more useful. 800-822-3522, 510-734-6767

Imagination Software's IMAGInE, which is built on the Kofax printing, viewing, and scanning engine, is a programming tool that allows you to add imaging tools to Windows applications. IMAGInE (\$129 for single-user license) is compatible with Visual Basic, Visual C++, and Borland C++, and it can be used either as a development tool or as a standalone imaging application. 301-593-6567

access or provide everyone in the network with a modem. Carbon Copy still offers IPX support, as it did in Version 2.0; but now it supports NetBIOS protocols as well.

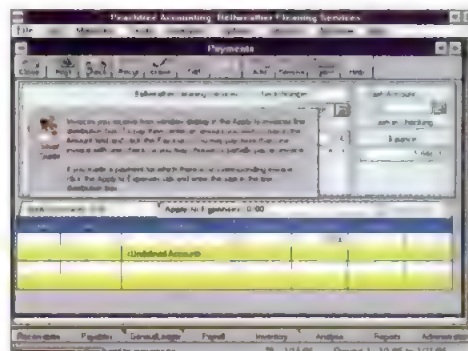
► **Carbon Copy for Windows, Version 2.5.** List price: \$199. Microcom Inc., 500 River Ridge Dr., Norwood, MA 02062; 800-822-8224, 617-551-1000; fax, 617-551-1021.

Circle 413 on reader service card

IMPROVED

Peachtree Upgrades Its Windows Accounting Software

Release 2.0 of **Peachtree Software's** Peachtree Accounting for Windows was chosen as one of three winners of Editors' Choice Awards for small-business accounting software ("Small Business Accounting," January 25, 1994); the other two were Microsoft Profit and Intuit's QuickBooks for Windows. Known for being the more business-like of the low-priced accounting packages, Peachtree Accounting for Windows is now in Release 3.0, making it the first of the two remaining Editors' Choice Winners to upgrade in 1994 (Great Plains Software has taken back Microsoft Profit, which it developed for Microsoft). Release 3.0 has an alarm function to alert you to time-based information, such as accounts past due, and a WYSIWYG report designer for creating custom reports. To achieve improved readability of reports you can click on elements of reports to be linked with the corresponding database detail.



Peachtree's Guide pops up on-line to explain the accounting process.

Other enhancements were made to the inventory portion of the package, which now lets you work with a variety of costing methods and maintain five pricing levels for each product.

► **Peachtree Accounting for Windows, Release 3.0.** List price: \$169; upgrade, \$89. Peachtree Software Inc., 1505-C Pavillion Pl., Norcross, GA 30093; 800-228-0068, 404-564-5700; fax, 404-564-5888.

Circle 414 on reader service card

IMPROVED

DacEasy DOS Accounting Modules Step Up to Version 5.0

DOS accounting packages are by no means hisstory, as is shown by **DacEasy's** announcement that it will upgrade its entire line of DOS-based accounting products. DacEasy Accounting Five, which is the main module, gives you several added and improved features, including the ability to print on-line cash reports, the addition of a cash-flow-analysis report, and better-performing backup compression. With the new version of the payroll module, you can now calculate multiple-state withholdings and local-tax withholdings, do cost allocations by department, and print Schedule B tax reports. The payroll portion of the package can also handle special accounting situations, such as deductions, third-party sick pay, and group-term life. The Point of Sale and Order Entry add-on modules have also been enhanced to include promotional pricing capabilities and debit-card approval.

► **DacEasy Accounting Five.** List price: \$149.95; unlimited network license, \$299.95. **DacEasy Payroll Five.** List price: \$149.95; unlimited network license, \$299.95. **DacEasy Point of Sale Five.** List price: \$399.95. **DacEasy Order Entry Five.** List price: \$399.95; unlimited network license, \$699.95. DacEasy Inc., 17950 Preston Rd., #800, Dallas, TX 75252; 800-322-3279, 214-248-0305; fax, 214-713-6331.

Circle 415 on reader service card

NEW

Toshiba PCMCIA Card Displays And Captures Full-Motion Video

Nogatech has developed a Type II PCMCIA card for the **Computer Systems**



Toshiba's full-motion PCMCIA video card.

Division of Toshiba America Information Systems. The new card is a real-time video display and capture board for portable computers. Called the Noteworthy Portable Digital Video Card, this new component is part of Toshiba's Noteworthy series of PCMCIA peripherals.

When it is used as part of a multimedia system, the card displays full-motion video, controls audio volume, and can even display full-screen television broadcasts

BRIEFS

Software

PR-Consult has released an upgraded Version 1.1 of its BizTrav International. The \$79.95 package packs information about holidays, currencies, trade shows, and useful phone numbers (now including hotel and airport information) for 25 countries into 6MB of hard disk space. The BizTrav package also includes a voltage-conversion tool that will show the itinerate person which type of plug is needed in each country discussed in the package. 619-625-4622.

Automap, creators of Automap Road Atlas, has released a CD-ROM collection called AutoMap Streets (\$49.95). The AutoMap Streets CD-ROM contains detailed maps from Etak Inc. of downtown New York, San Francisco, Washington, and Chicago, as well as 200 other street maps. The data is locked on the CD-ROM, so you pay for the maps you want. One free unlock is included, with additional unlocks priced at \$30. 800-440-6277, 206-445-3552.

And Finally

Pacific Crest Technologies has dropped the price of the CardGabber business-card scanner by \$110, which brings it down to \$239. . . . **Horizons Technology's** Sure!MAPS 2.1 CD-ROM-based mapping software is now \$69—\$130 cheaper than it was originally. . . . **Spry**, the developer of the AIR Series of Internet connection software, now helps you explore the Internet once you're connected NetAccess, a directory that will link you to home pages of computer-related businesses that have a presence on the Internet, is included in the AIR Series; alternatively, you can get it by going directly to Spry's home page. . . .

Hayes Microcomputer Products has lowered the prices of 9.6-Kbps and 14.4-Kbps modems in its Accura line by 10 to 16 percent; the modems now start at \$149 and go up to \$179, depending on the model and the speed that you choose. . . . The **Baarns Consulting Group** has dropped the price of The Baarns Utilities, a series of utilities for Microsoft Excel 5.0, from \$89.95 to \$69.95.

(with an optional tuner module). With the card, you will be able to display 256 color NTSC video signals at a 320-by-240 resolution at up to 30 frames per second; PAL signals can be displayed at a slightly better resolution of 384-by-288 at up to 25 fps—which is not optimal performance by desktop standards.

However, bear in mind that this is, after all, among the first-generation of PCMCIA multimedia devices. The capture features are not much stronger: You will be able to get a maximum resolution of 320-by-240 in .AVI format for full motion, and 640-by-480 resolution for 16-bit still images. You won't be able to record though, because the card does not capture sounds. Toshiba also offers an optional video camera module.

► **Noteworthy Portable Digital Video Card.** List price: \$499. Computer Systems Division of Toshiba America Information Systems Inc., 9740 Irvine Blvd., Irvine, CA 92718; 800-959-4100, 714-583-3000.

Circle 416 on reader service card

NEW

Multipurpose Vista-S6 Scanner Priced Under \$1,000

Whether you need a scanner for high-speed document scanning or for high-quality desktop publishing, the Vista-S6 scanner from **UMAX Technologies** could prove to be the value choice. For less than \$1,000, you could be running a 24-bit flatbed color scanner that will be flexible to your needs. Attach an optional page feeder (\$495) and let the stepping motors and 256K caching buffers scan 8.5- by 11-inch pages at 7 seconds per sheet in gray scale and 21 seconds per sheet for color at 200 dots per inch. Alternatively, the unit can be used for graphics with 600- by 300-dpi normal resolution and a 1,200- by 1,200-dpi maximum resolution using the UltraView software interpolation.

For better image reproduction, UMAX included de-screening capabilities, color-management software for color calibrations, and a tri-linear CCD cold cathode lamp. The Vista-S6 is available with two software bundles. The LE bundle includes Caere's OmniPage Direct and Adobe's Photoshop LE, while the PRO bundle has a full version of Adobe's Photoshop and Harvard System Corp.'s Kai's Power Tools.

► **Vista-S6 LE.** List price: \$945. **Vista-S6 PRO.** List price: \$1,045. UMAX Technologies Inc., 3353 Gateway Blvd., Fremont, CA 94538; 800-562-0311, 510-651-8883; fax, 510-651-8834.

Circle 417 on reader service card

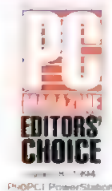
Micron 90MHz Pentium

"The Micron P90PCI combines an excellent design with quality components to create a powerful Windows machine."

PC Magazine, June 28, 1994



June 28, 1994
P90PCI PowerStation



READERS' CHOICE SERVICE & RELIABILITY

RELIABILITY

REPAIR SERVICE

TECHNICAL SUPPORT

**ABOVE
AVERAGE**

**ABOVE
AVERAGE**

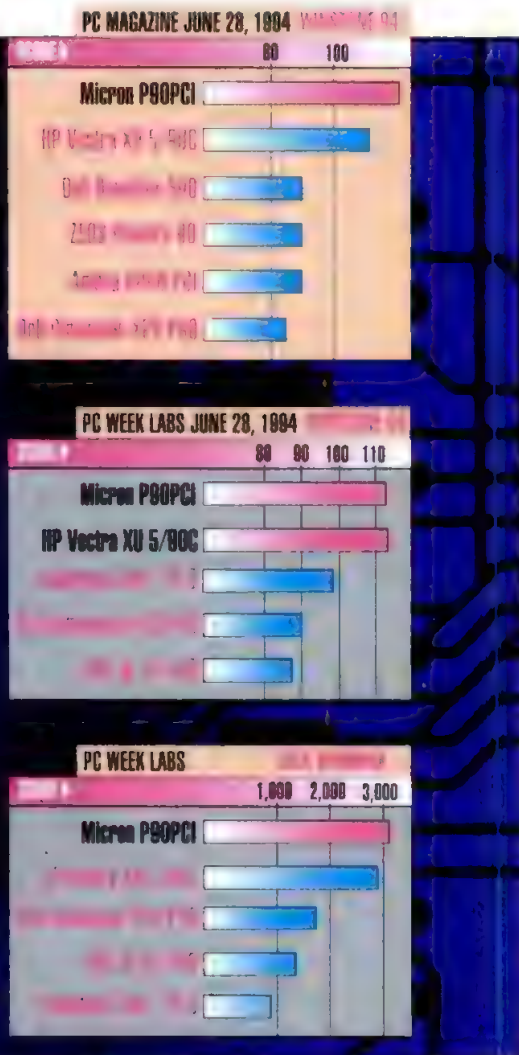
**ABOVE
AVERAGE**

July 1994

Award Winning By Design...

"Micron's PowerStation defined the outer limits of performance in our benchmark testing...the best available combination of price and performance."

PC Week, June 27, 1994



P90PCI POWERSTATION

- Intel™ Pentium™ 90MHz processor
- 8MB RAM (expandable to 192MB)
- 420MB 14ms IDE hard drive
- 256K write-back cache (to 512K)
- 4 ISA, 2PCI, 1 ISA/PCI slots, Flash BIOS
- 2X CD-ROM drive, 3.5" floppy drive
- PCI graphics accelerator (2MB)
- 15" Micron 15FGx, 1280NI, .28mm, MPRII
- Desktop "Tool Free" chassis, 3 cooling fans
- Microsoft® Mouse, 101-key keyboard
- MS-DOS® & Windows™ for Workgroups
- Microsoft Office® 4.2 on CD*

\$2,599 LEASE - \$94/MO.

- 16MB RAM
- 527MB 12ms IDE HD
- 15" Micron 15FGx

\$2,999
LEASE - \$108/MO.

- 32MB RAM
- 1GB SCSI-2 HD
- 17" Micron 17FGx

\$4,299
LEASE - \$147/MO.

- 64MB RAM
- 2GB SCSI-2 HD
- 17" Micron 17FGx

\$6,299
LEASE - \$216/MO.

PCWEEKLABS
ANALYST'S
CHOICE

June 27, 1994
P90PCI PowerStation



- 30 DAY RISK-FREE MONEY BACK GUARANTEE
- ONE YEAR EXPRESS PARTS REPLACEMENT
- LIFETIME TOLL-FREE TECHNICAL SUPPORT
- ON-SITE SERVICE OR SYSTEM REPLACEMENT

*MS-WORKS AND OFFICE DOCUMENTATION ON-LINE. HARD COPY AVAILABLE FOR ADDITIONAL CHARGE.

MICRON
COMPUTER, INC.

800-556-4395

MON-FRI 7AM - 8PM SAT 8AM - 5PM (MST) 900 E. Karcher Road • Nampa, Idaho 83687 (208) 465-3434 • FAX (208) 465-3424 Purchase Order FAX (208) 467-5384

©1994 Micron Computer, Inc. All rights reserved. All prices and specifications subject to change without notice. Micron Computer, Inc. cannot be responsible for omissions, errors in typography or photography. Intel, Intel Inside, Pentium and Overdrive are registered trademarks of the Intel Corporation. Microsoft is a registered trademark and Windows is a trademark of Microsoft Corporation. All other company trademarks are trade names of each respective company. Prices do not include shipping or handling. 30 day risk-free money back guarantee does not include return freight or shipping and handling charges. Applies only to Micron brand products, and begins from date of shipment. All returns require RMA numbers and must be shipped in original condition prepaid and insured.

CIRCLE 370 ON READER SERVICE CARD

Five Good Reasons To Buy Peachtree Accounting For Windows.



December 18, 1993



March 1994



January 1994



March 1994



January 25, 1994

First It Won Every Major Award. Then We Made It Better.

Now more than ever, Peachtree Accounting for Windows is the easiest, most powerful tool you can use to build your business.

The critics were already raving about Release 2.0. Now we've taken real-world input from users to make an incredible program even better.

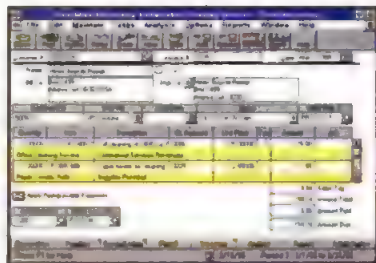
Release 3.0 offers all the essentials you need to organize your company's finances. You can keep up with accounts payable and receivable, track inventory, keep your general ledger, take care of payroll, prepare budgets, and create invoices. Plus you can design business forms, create custom reports, track contacts with your prospects, analyze your sales, and reconcile your checkbook, all within one easy-to-use product. And Release 3.0 includes support for multiple users and networks at no added cost.

Unlike so-called bookkeeping programs, you'll have the solid foundation of true

double-entry accounting working for you every step of the way. And using it couldn't be easier. You just fill out on-screen forms that look like the purchase orders, invoices, and checks you use every day.

Powerful Tools To Help You Make More Money.

If this were only an accounting package, it would still be the best in the business. But Release 3.0 offers much more.



New customizable Alert Signals automatically set off an alarm when a particular event happens. Say, your expenses suddenly go over budget, or inventory drops below a certain level. An Events Log allows you to track transactions, see when quotes expire, and know when an invoice is overdue.

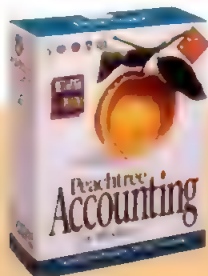
The new Manager's Series lets you keep track of who owes you money, who you owe, and allows you to play out "What if?" scenarios. Easy to read bar and pie charts help you monitor your financial status. And if you

want to see more detail about a particular figure, just double-click.

Of course, when you buy Peachtree, you know that your satisfaction is unconditionally guaranteed for 60 days. We'll provide 30 days of free phone support, plus ongoing support via fax, CompuServe, America Online, and Prodigy. So why wait? Call now to get the world's best accounting software for small business.



Peachtree®
The first name in small business accounting software.™



Make That Six.

Introducing Release 3.0.

\$139

Save \$30 Off Our Regular Price Of \$169.
Order Now. Call 800/428-9973.

Also available at dealers nationwide. Special price good through 12/31/94. CD-ROM Version with \$500 in extra software available at same price. \$8.75 shipping and handling will be added to your order.

System Requirements: IBM Compatible 386 or higher, DOS 3.3 or higher, Windows 3.1 running in standard or enhanced mode, 4 MB RAM, 12 MB free hard disk space, VGA or higher monitor, mouse. Works with any Windows 3.1 compatible printer.
© Copyright 1994, Peachtree Software, Norcross, Georgia. • All products are trademarks of their respective companies.

CIRCLE 393 ON READER SERVICE CARD

Read Only

REVIEWS OF THE LATEST BOOKS FOR THE PC USER

Edited by Tin Albano

A Strunk and White for E-Mail Writers

BY DON WILLMOTT

Given the explosion of interest in electronic mail and on-line services, it was inevitable that someone would write a book like *The Elements of E-mail Style*. Fortunately, David Angell and Brent Heslop got there first, and their slim, witty paperback, which quite deliberately models itself on Strunk and White's classic *The Elements of Style*, has plenty of commonsensical advice for writing and managing e-mail effectively.

Like Strunk and White, Angell and Heslop provide some basic grammar lessons. In fact, grammar rules fill about half the book, but you can skip them. Let's face it: If you don't know how to use apostrophes and semicolons correctly by now, no single book is going to give you the help you need. Things like printed lists of commonly misspelled words are also of questionable value.

The book is much more valuable as a guide to e-mail style and etiquette (or "netiquette"). Since e-mail is conversational but not verbal, the danger of being misinterpreted is ever present. Jokes,

sarcasm, and the like can easily cause trouble and lead to dreaded "flame" mail. Angell and Heslop point out the pitfalls and show you how to avoid them with careful, concise wording of your messages. They even tell you how to respond diplomatically when you get flamed. One amusing New Age piece of advice: "Acknowledge the person's need to flame."

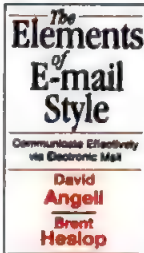
Another fun chapter shows you how to use ASCII characters to create boxes, lines, and even rudimentary art for your e-mail messages, and the final chapter gives special advice for users of the Internet, that chaotic corner of cyberspace where good on-line behavior is especially important.

If you use e-mail with any frequency, you eventually learn what works and what doesn't when you write messages. *The Elements of E-mail Style* can help you eliminate some of the trial and error. After all, no one

likes to get flamed.

► **The Elements of E-mail Style**, by David Angell and Brent Heslop, \$12.95. Addison-Wesley, 617-944-3700. ISBN: 0-201-62709-4.

Circle 444 on reader service card



Short and Sweet

The authors of *The Elements of E-mail Style* list these and other acronyms to speed up writing your e-mail messages:

BTW	By the way
CUL	See you later
FWIW	For what it's worth
GMTA	Great minds think alike
HHOK	Ha ha only kidding
IMHO	In my humble opinion
ROFL	Rolling on the floor laughing
TTFN	Ta-ta for now

A Guide to Simple Central Management

BY RICH BRADY

Do you need help with your central management system? Are you overwhelmed when trying to figure out the best ways to gather your network's information?

Managing Internetworks with SNMP, by Mark Miller, will help you understand the complexity of information base data retrieval.

With SNMP (Simple Network Management Protocol), now an accepted format, we can access valuable information using a standard that all vendors agree on. In *Managing Internetworks*, Miller uses well-thought-out examples and easy-to-understand illustrations to demonstrate how to get the most out of SNMP. Also included are informative diagrams and screen shots that help elucidate the enormous amount of data associated with SNMP. *Managing Internetworks* also covers SNMP Version 2 and RMON MIB (Remote Monitoring Management Information Base).

With each new chapter, Miller

explains another aspect of SNMP and how best to use it with your particular network setup—from the centralized networks of the past to the ever-expanding enterprise networks we have today.

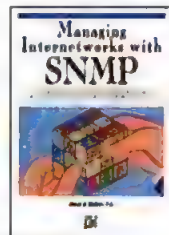
This book is a wonderful resource filled with tips and examples to help any administrator use SNMP to understand and manage a network properly.

The author clearly defines the multitude of network acronyms that can be intimidating and confusing. *Managing Internetworks* also offers an outstanding glossary of networking terminology.

The trick to being a good network manager is catching the problem before it escalates. *Managing Internetworks* gives network managers a tool for understanding how best to use SNMP to make their networks more productive and less troublesome.

► **Managing Internetworks with SNMP**, by Mark Miller, \$44.95. M&T Books, 800-488-5233. ISBN: 1-55851-304-3.

Circle 445 on reader service card



Read Only Recommends

Whether you're new to the field of digital image editing or a professional artist at a magazine, you're sure to find *Digital Imaging for Visual Artists*, by Sally Wiener Grotta and Daniel Grotta, a valuable educational tool as well as an indispensable resource. \$49.95;

Wincrest/McGraw Hill, 800-233-1128; ISBN: 0-07-025067-7.





NOW THAT YOUR BUSINESS IS GETTING
A LITTLE BIGGER, GUESS YOU'LL
BE NEEDING AN OFFICE MANAGER.



provide vast, centralized storage as your business grows larger.

And while most servers are complicated, the ProSignia VS can make your life easier. Our optional CD-based SmartStart simplifies the whole process of setting up a reliable system. And Insight Manager (also an option) keeps an eye on key parts, pinpointing problems *before* they can disrupt operations.

Of course, the ProSignia VS also provides the security of

Compaq's three-year on-site warranty** and 24-hour support line.

To find out how you can give your company more agility as it grows, visit an authorized Compaq reseller. If you'd like more information, or if you'd like the name of your nearest reseller, call us at 1-800-638-8328, ext. 450. We can show you the best kind of office manager. One that works as hard as you do.

COMPAQ

Henry K. Kohl
CompuAdd Manufacturing Engineer

"I Build Every CompuAdd System To The Highest Standards Possible..."

Now Choose The Pentium™ System That's Right For You... At A Price That's Right For Everyone!

Pentium™ processors represent a quantum leap forward in PC computing power. Because they put superscalar technology on your desktop. So you can simultaneously process two instructions per clock cycle! As a result, graphics-oriented software like Windows, and power-hungry applications like multimedia, full-motion video and CAD/CAM can run faster — *if* the systems they run on weren't built for something slower. That's a big *if*...and the best reason to call CompuAdd.

Our manufacturing process begins with your phone call. Instead of an order-taker, you talk to a problem-solver...a professional trained to help you determine your needs before making your purchase. For example, you may need faster video, more or less main memory, a larger or smaller cache, a faster or slower clock speed....It all depends on how you plan to use your system. And *that* determines the system we build for you. The result is a system custom-crafted to meet your specific needs.

Most people would happily spend more and wait longer for such service. At CompuAdd, you actually pay less and get delivery sooner! Because being in the

business for more than 12 years — which is longer than most of our competitors — has taught us to work smarter than all of our competitors.

We buy more economically, inventory more intelligently, assemble and distribute more efficiently. And since each of our systems is made to order, all are flawlessly crafted and perfectly balanced for peak performance. So customer satisfaction is extremely high, and returns are extraordinarily low.

Which is why we can provide a 10-point guarantee that makes choosing CompuAdd risk-free! So if you're ready for Pentium — or any other Intel-based PC — we're ready to help. Call now!



**C466D
Low Profile**

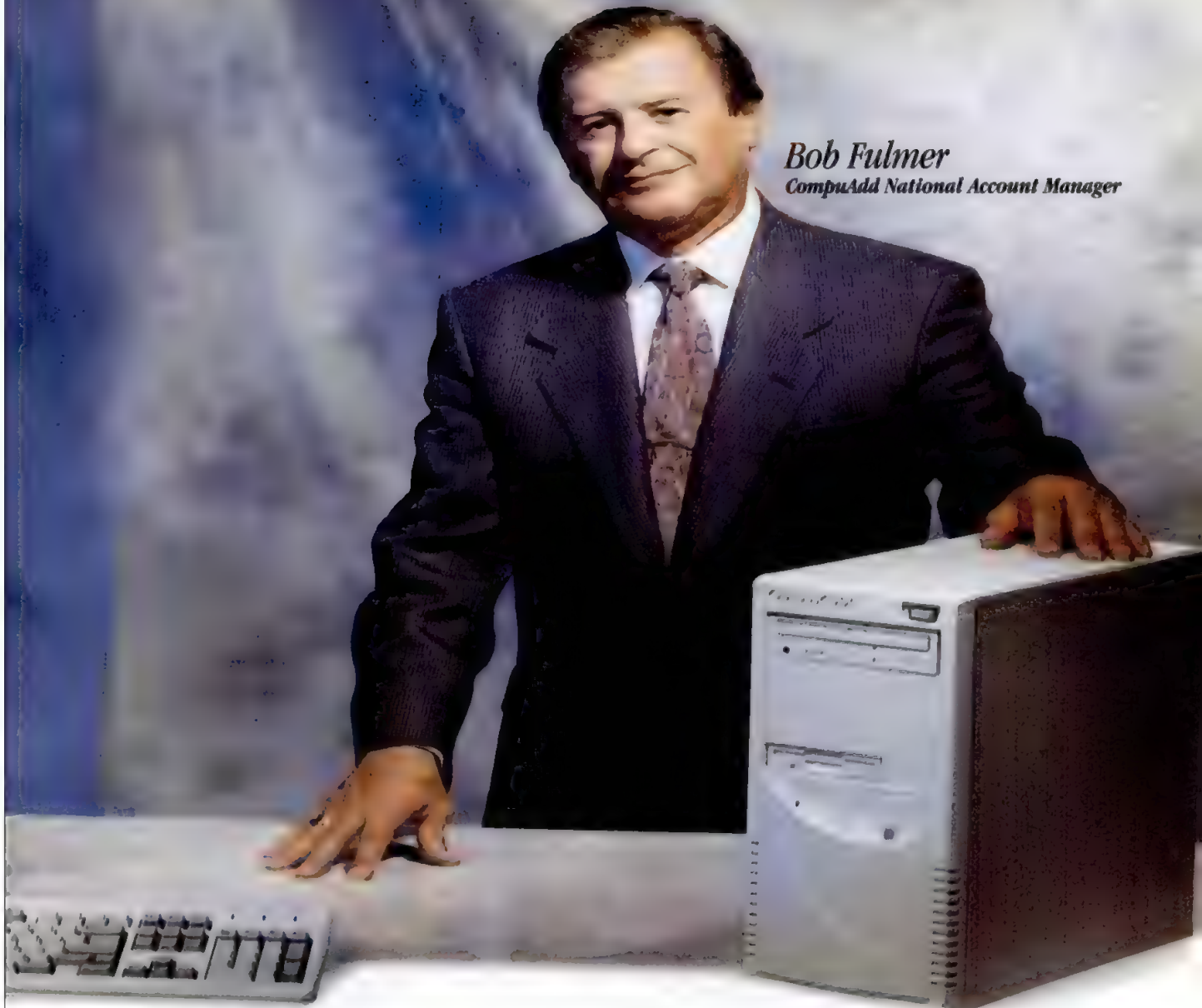


**CP60p
Desktop**



**CP90p
Mini-
Tower**

Bob Fulmer
CompuAdd National Account Manager



"...And I Sell Them At The Lowest Prices Imaginable."

	C466D Low Profile	CP60p Desktop	CP90p Mini-Tower
CPU	60MHz 486DX2	60MHz Pentium	90MHz Pentium
RAM	8MB	8MB	8MB
Cache	128KB	256KB	256KB
Hard Drive	420MB	420MB	420MB
Monitor	15" N-I	15" N-I	15" N-I
Video	1MB	1MB-PCI	1MB-PCI
CD ROM	Optional	Dual Speed	Dual Speed
Fax/Modem	9600 Fax/2400 Modem Answering Machine	9600 Fax/2400 Modem Answering Machine	9600 Fax/2400 Modem Answering Machine
<i>All 3 Systems Include: 101-key Keyboard, Microsoft Mouse, 3.5" Floppy, MS DOS 6.2, Windows for Workgroups 3.11, CompuServe Starter Kit...and More!</i>			
Price	\$1,999	\$2,549	\$2,999
Lease	\$73/mo.	\$93/mo.	\$109/mo.



- ☐ 30-Day Money-Back Guarantee
- ☐ 30-Day Price Protection
- ☐ One-Year Onsite Service
- ☐ One-Year Limited Warranty
- ☐ Out-of-Warranty Repairs
- ☐ Lifetime BBS Support
- ☐ Lifetime Technical Support
- ☐ Onsite Installation Option
- ☐ Remote Rescue Online Support
- ☐ Environmentally Sensitive Packaging

To Order Or To Receive A Free Catalogue
Call (7am - 7pm CST)

1-800-456-3660
Fax 512/331-2862

CompuAdd
CUSTOMER DRIVEN, BY DESIGN.

12317 Technology Boulevard
Austin, Texas 78727

CIRCLE 126 ON READER SERVICE CARD



©CompuAdd Corporation 1994. Prices and specifications are subject to change without notice. CompuAdd is not liable for damage due to omissions or typographical errors. The Intel Inside logo is a registered trademark of Intel Corporation. All other brand and product names are trademarks or registered trademarks of their respective companies.



JetDirect EX External print servers support any parallel based printer JetDirect cards support HP LaserJet, HP DeskJet and HP DesignJet printers with I/O slots

NOS compatibility
 NetWare, NetWare, IBM LAN Server, Microsoft LAN Manager, Apple EtherTalk, Apple LocalTalk*, Windows NT, Windows for Workgroups, UNIX, HP-UX, SunOS, Solaris, IBM AIX, SCO UNIX, Ipd**

compatibility
 Ethernet 10Base-T, 10Base2, Token Ring (4/16 Mbps), Apple LocalTalk*

Multiple protocols with automatic switching

Software management utilities such as HP JetAdmin and HP JetPrint^{††} for NetWare and UNIX for easy printer installation remote status and management

Supports SNMP based network management

Flash memory for easy upgrades**

Nothing Supports Your Printers Better Than HP JetDirect Print Servers.

Now you can easily connect and manage the printers in your network environment.

If you've been looking high and low for a way to get all your printers on the network, rest your eyes here for a moment. Because the HP JetDirect family of print servers has a solution that works with

the printers in your company. Not to mention virtually any LAN environment.

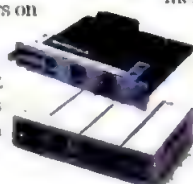
And thanks to the software utilities we've included, installation is quick and management of your printers is easy. Plus, you'll

enjoy vastly improved printer performance.

Of course, you'd expect all this from Hewlett-Packard, the leader in

network printing. So give us a call at 1-800-533-1333, Ext. 8464.* You'll soon discover that when it comes to sharing printers on a network, nothing stacks up to HP JetDirect print servers.

Another smart networking product from HP.



JetDirect cards connect HP printers with I/O slots

JetDirect EX connects any parallel-based printer

**hp HEWLETT®
PACKARD**



*Not supported by JetDirect EX. **Supported by JetDirect EX, fall of 1994. † In Canada, call 1-800-387-3867 Dept. 8464. †† Supported with Netware only. Microsoft is a U.S. trademark and Windows is a trademark of Microsoft Corporation. UNIX is a registered trademark in the United States and other countries. Licensed exclusively through X/Open Company Limited. ©1994 Hewlett-Packard Company.



Michael J. Miller

The Politics of PC Science

The relationship between the personal computer industry and the government used to be one of benign neglect. Federal, state, and local governments bought PCs and, of course, taxed PC hardware and software companies. Apart from that, the

government has treated the PC industry as if it were an enigma. In the past decade, the computer industry has been the most vibrant sector of the American economy—growing, changing, and evolving at a rate never before imagined. And all this happened without government involvement!

This situation is about to change. Government involvement in the PC industry is growing. It has to. PCs, which used to be productivity tools, are now tied into large communications networks, and that communications infrastructure in turn needs standards and regulations. PCs are no longer just personal computers; they're personal communicators as well.

Let's take the information superhighway, for example. Vice President Al Gore claims to have coined this now-overused term, and there's no question that government policy will dramatically affect the future of large communications networks. Although no one in the government really planned it, the Internet—the closest thing to an information superhighway we have today—exists primarily at government sites and because of government research grants.

IT DOESN'T HURT TO ASK

All of this has important implications, not just for the PC industry but for all of us who use PCs and care about how this technology will evolve in the future. In the next couple of months, some of us will be going to the polls to vote in federal, state, and local elections. I suspect, however, that many of us have no idea where the candidates stand on issues involving personal technology.

The biggest question our elected officials face is determining who will control the network connection that ties your home with

whatever communications services exist in the future. There is no shortage of contenders; local phone companies, long-distance carriers, and cable-television vendors all want to carry the data. In some cases, wireless communications services or even local electric companies want to provide the service. But in all cases, the questions aren't nearly as much about technology as they are about investment and regulation.

I've been pondering some tough questions raised by the issues of access and communications. You should too. Better yet, cut out this page and send it to the candidates who will be running for office next month. Find out where they stand, because these issues are too important to ignore. Here's a list:

- Who should be allowed to provide these connections?
- Most people agree we want competition, but what's the best way to get fair competition?
- Is it fair to let a company that has a monopoly in one part of the market offer unregulated services in another part?
- What's a fair rate of return for a regulated utility?
- Should all information utilities be deregulated and, if so, under what circumstances and in what time frame?



Do our elected officials fully understand the ramifications of our developing communications networks?

MORE POINTS TO PONDER

In regard to regulating PC technology, here are several areas where the government is either already involved or likely to become involved in the near future:

Governing the Internet. The Internet grew up in a period when most elected officials probably didn't even know it existed. The Internet has blossomed in the past few years with increasing numbers of users—20,000 new users per month, according to the Internet Society. With this growth come increasing demands for control.

Michael J. Miller

- Who should own and run the central servers?
- How can the Internet be managed to keep it running smoothly?
- Should commercial services be allowed on the Internet?
- Should such services be regulated and, if so, how?
- How can we make the Internet more secure?

Protecting intellectual property. Copyright laws were established during a much simpler time, when it was relatively difficult and expensive to copy information. But now that more information—ranging from data to movies to sound—is stored in a digital form, making a perfect copy is both easy and cheap.

- Should any such copying be legal and, if so, how much?
- What is fair use in a digital world?

Changing the patent laws. Not everyone agrees with me that software patents should

be thrown out completely, but many people in the computer industry agree that we need changes in the process by which software patents are granted.

- How can we make sure that the patents make sense and are not silly or overly broad?
- How can we get more comments on proposed patents earlier in the process?
- Should patent applications be disclosed when they are filed instead of when they are granted?
- In a world moving as fast as the PC industry, with 6-month product cycles, does the 17-year period of patent protection still make sense?

Ensuring privacy. This is at the heart of the evolving debate on the Clipper chip. This chip encrypts information using a secret key escrow algorithm in which two government agencies each hold half the key. To gain access to information, a court order is needed along with both halves of the key. The government says such a scheme is necessary to fight crime while still allowing security; opponents say it endangers civil liberties and will decrease our exports. Lately, the administration seems to be

backing down on using the chip for data communications, while still wanting to use it in telephone systems.

- How do you balance the right to privacy against the need to fight crime and terrorism?
- Does the key escrow system make sense?
- Is this the right security scheme?

Access to information. All the earlier questions are fairly difficult, but these are the toughest.

- Should the government ensure basic access to information for everyone?
- If so, how do you fund it?
- Will students who don't have access to information at home be guaranteed access at school?
- If so, how do schools get funded?

While I have opinions on many of these questions, I certainly don't have all the answers. I bet you don't either. What's really frightening is that the officials who will have to deal with these issues don't even think about them—let alone understand the underlying technology. So before you go to the polls, don't be afraid to ask the various candidates running for elected office in your town and state what they think about these important issues. □



SUBSCRIPTION SALE

Answers. Advice. Strategies. Solutions.
22 times a year, you get it all
from PC MAGAZINE.

To receive your lowest possible rate,
call toll-free:

1-800-289-0429

BONUS:

Free Home or Office Delivery

Please mention code 4294 to our operator.

Value
means more
computer for
your money...

Great features, performance and reliability.



Which is why so many PCs and notebooks

Are really Acer's - identical.



and why so many smart buyers choose Acer.



The Industry Source
Means Value.

Great AcerNote pricing means you can snap up a superior notebook.

DESKTOP POWER TO GO

Now you can have twice the power of a desktop system in your notebook computer. With the lightning-fast IntelDX4™ processor running at 75MHz, your productivity will reach new heights. After all, if you're busy enough to need a notebook, you sure don't have time to sit and watch the hourglass.

MODULARITY FOR YOUR NOTEBOOK

Convenient, upgradable architecture has arrived with the AcerNote 780cx. It features a revolutionary modular design that makes upgrading components and servicing easy. That's



important, because when you're traveling with your notebook, your system administrator won't be around to help you.

ADD NEW FEATURES AS THEY ARE ANNOUNCED

As higher capacity hard drives become available, you can plug them in yourself with the easy-to-open Acer SmartCase.™ And look forward to being able to grow into the latest and greatest features as they are announced.

PCMCIA GIVES YOU EASY COMMUNICATION

You can simply slide in a credit card-sized PCMCIA card that lets

you tap into your network, send information to a fax machine via modem, access additional storage devices or plug in more memory. And once you return to the office, you can easily transfer your new data to your desktop.

COUNT ON DEPENDABILITY WITH THE INDUSTRY SOURCE, ACER

Many of the leading notebooks are manufactured by Acer—now you can have the confidence that comes from using the industry source.



AcerNote 780cx IntelDX4/75MHz

- IntelDX4/75MHz processor with built-in 16KB cache and coprocessor
- 8MB system RAM
- SmartCase™ easy-to-open modular housing for easy upgrades and serviceability
- Easily upgradable 340MB 2.5" hard drive
- Easy-to-remove keyboard for quick memory and BIOS upgrade
- EasyTrac™ centrally located removable trackball
- 2 PCMCIA Type II Slots/1 Type III Slot
- 1.44MB diskette drive
- Local bus accelerated graphics
- Suspend-to-Disk feature, "No-Reboot" CMOS setup and Suspend-Resume hot button preserve battery life
- 9.5" active-matrix LCD displays 256 colors
- Simultaneous LCD/CRT display
- Slim 8.66" x 11.4" x 2.1" case weighs 6.4 lbs, including NiMH battery pack
- Graphic battery gauge indicates remaining battery life
- One year 24-hour "Hot Swap" warranty in the U.S. and Canada



\$3,995

\$132 A Month Business Lease

NEW



The Industry Source means value.

EXPANDABILITY FOR TOMORROW, POWER FOR TODAY

The AcerNote 760 series gives you all the expandability of the 780cx, plus more power than many current desktop PCs. The high performance of the Intel486™DX2/50MHz processor, combined with local bus architecture, gives you the power to take all your projects on the road with you, not just the less demanding ones.



ACERNOTE GIVES YOU EASY UPGRADES!

You also get the same convenient, upgradable architecture in the AcerNote 760 series as in the higher-priced 780cx. A revolutionary modular design makes upgrading components and servicing easy. If you're on the road when you need more storage or memory, you can simply plug in off-the-shelf components yourself.

SUSPEND/RESUME HOT BUTTON SAVES YOU TIME!

The AcerNote 760 series offers time-saving benefits for the traveler, including the ability for you to jump right back into

your applications from where you left off. By using a "hot button" you can close down and re-enter your work instantly, without having to wait for the usual boot-up procedure. This power-saving feature assures a 3-5 hour battery life.

ASSISTANCE AROUND THE GLOBE

Because the most powerful notebook does you no good if it's not working when you need it, the AcerNote series is backed by a one-year, 24-hour replacement warranty in the U.S. and Canada. To assure you support in over 20 countries worldwide, a free one-year Acer International Travelers Warranty is also included.



30-DAY MONEY-BACK GUARANTEE

We are so sure that you'll be totally satisfied with your new Acer system that we're offering a full 30-day money-back guarantee—no questions asked.



AcerNote 760c i486DX2/50MHz

- i486DX2/50MHz processor with built-in 8KB cache
- 4MB system RAM
- SmartCase easy-to-open modular housing for upgradability and serviceability
- Easily upgradable 340MB 2.5" hard drive
- Easy-to-remove keyboard for quick memory and BIOS upgrade
- EasyTrac centrally located removable trackball
- 2 PCMCIA Type II Slots/ 1 Type III Slot
- 1.44MB diskette drive
- Local bus accelerated graphics
- Suspend-to-Disk feature, "No-Reboot" CMOS setup and Suspend-Resume hot button preserve battery life
- 9.5" dual-scan LCD
- Simultaneous LCD/CRT display

- Slim 8.66" x 11.4" x 1.8" case weighs 6.4 lbs, including NiMH
- Graphic battery gauge indicates remaining battery life
- One year 24-hour "Hot Swap" warranty in the U.S. and Canada

\$2,495

302 A Month Business Lease



Cards
Welcome



LEASING

Call 800-848-ACER

When calling,
please reference #094 ACD

Monday through Friday 6 AM-6 PM and Saturday 8 AM-4 PM Pacific Time

World class service with assistance around the globe.

ACERNOTE 760cx i486DX2/50MHz THE PRESENTATION PERFORMER

- i486DX2/50MHz Processor with Built-In 8KB Cache
- 4MB System RAM
- 2 PCMCIA Type II Slots/1 Type III Slot
- 9.5" Active-Matrix LCD Displays 256 Colors
- 340MB 2.5" Hard Disk Drive
- Palmrest with Integrated Trackball
- 1.44MB Diskette Drive
- Local Bus Accelerated Graphics
- MS-DOS 6.2, Microsoft Windows 3.1
- International Travelers Warranty
- 24-hour "Hot Swap" Warranty in the U.S. and Canada

\$3,495

\$128 A Month Business Lease

ACERNOTE 735c 486SX/33MHz THE VALUE WINNER FOR PRESENTATIONS

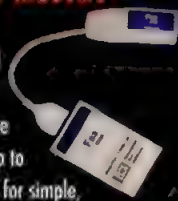
- Intel SL-Enhanced 486SX/33MHz Processor
- 4MB System RAM
- 2 PCMCIA Type II Slots/1 Type III Slot
- 9.5" Dual-Scan LCD Color Display
- 209MB 2.5" Hard Disk Drive
- Palmrest with Integrated Trackball
- 1.44MB Diskette Drive
- Local Bus Accelerated Graphics
- MS-DOS 6.2, Microsoft Windows 3.1
- International Travelers Warranty
- 24-hour "Hot Swap" Warranty in the U.S. and Canada

\$1,995

\$73 A Month Business Lease

PCMCIA FAX/DATA MODEMS AND LAN CARDS

Your office at your fingertips! A removable PCMCIA card allows you to send and receive faxes and data at a rate of up to 14.4 baud, with fax software for simple, error-free operation. LAN cards, with your option of either twisted-pair or coaxial cable, get you into your office network with ease.



SPARE BATTERY

NiMH BATTERY PACK \$169 **NiCad BATTERY PACK \$99**

ADDITIONAL MEMORY

AcerNote Series—4MB
Memory Upgrade

\$269

AcerNote Series—8MB
Memory Upgrade

\$699



Acer



New lower AcerPower prices mean you can step up to a better desktop.



pentium

ACER BRINGS 90MHZ PENTIUM™ PROCESSOR SYSTEMS TO MARKET

The 90MHz Pentium chip is the most powerful PC processor selling today. It runs PC software faster than any other processor available. With such dramatic advancements in technology, time to market really matters. As the industry source, Acer can incorporate changes into its product line more quickly than other companies. When you need the

latest and greatest hardware, talk to Acer.

POWER OF THE PENTIUM

The Pentium processor is fully compatible with the entire range of i486™ and i386™ processors, allowing backward-compatibility with the legion of 486 hardware in use. It has data integrity features for mission-critical applications, and includes multiprocessor capabilities needed by advanced servers and high-

performance desktops and workstations. The Pentium processor family utilizes advanced design techniques to speed up today's graphics applications and enable tomorrow's emerging applications, such as full-motion video and computer-aided design.



Join The Revolution With The AcerPower 90MHz Pentium Processor System

The AcerPower™ Pentium workstation represents the next technological leap forward by combining unparalleled 90MHz Pentium-based processing with the high-speed PCI local bus, for the ultimate in power and speed. The fast throughput of this system gives you the high-performance needed for the future with true-color, full-motion video and 3-D graphics. And PCI also allows automatic configuration of new peripherals as you install them into your system.

- Intel® Pentium/90MHz Processor
- 8MB System RAM (Expandable to 128MB)
- 256KB Second-Level Cache
- 540MB IDE Fast Hard Disk Drive
- PCI Enhanced Local Bus IDE
- Panasonic® 2X CD-ROM Drive
- 15" .28mm Non-Interlaced Flat Screen Digital SVGA Color Monitor
- 1MB 64-Bit PCI Graphics Accelerator Card
- 1.44MB Diskette Drive
- 2 PCI Expansion Slots
- 4 ISA 16-Bit Expansion Slots
- 1 Combination PCI/ISA Slot
- Microsoft® Windows™ for Workgroups, MS-DOS® 6.2, Productivity/Entertainment Packs, Works for Windows™, and Quicken® installed



\$2,595

\$95 A Month Business Lease

The Industry Source means value.

AcerPower Pentium/60MHz



- Intel Pentium/60MHz Processor
- 8MB System RAM (Expandable to 192MB)
- 256KB Second-Level Cache
- 420MB IDE Fast Hard Disk Drive
- PCI Enhanced Local Bus IDE
- Panasonic 2X CD-ROM Drive
- 1.44MB Diskette Drive
- 14" .28mm Non-Interlaced Flat Screen SVGA Color Monitor
- 1MB 64-Bit PCI Graphics Accelerator Card
- 2 PCI 64-Bit Expansion Slots
- 4 ISA 16-Bit Expansion Slots
- 1 Combination PCI/ISA Expansion Slot
- Microsoft Windows for Workgroups, MS-DOS 6.2, Productivity/Entertainment Packs, Works for Windows, and Quicken Installed



\$2,195

\$81 A Month Business Lease

PC World Best Buy

AcerPower 486DX2/66MHz



- Intel 486DX2/66MHz Processor
- 4MB System RAM (Expandable to 64MB)
- 128KB Second-Level Cache
- 340MB IDE Fast Hard Disk Drive
- Panasonic 2X CD-ROM Drive
- 1.44MB Diskette Drive
- 14" .28mm Non-Interlaced Flat Screen SVGA Color Monitor
- 1MB 64-Bit PCI Graphics Accelerator Card
- 2 PCI 64-Bit Expansion Slots, 5 ISA 16-Bit Expansion Slots
- 1 Combination PCI/ISA Expansion Slot
- Microsoft Windows for Workgroups, MS-DOS 6.2, Productivity/Entertainment Packs, Works for Windows, and Quicken Installed

\$1,795

\$66 A Month Business Lease

The New Value Leader

RELY ON THE STRENGTH OF A \$1.9 BILLION GIANT

Since our start in 1976, Acer has grown to be the vendor of choice for the world's top computer companies.

MULTIMEDIA UPGRADE KIT



Only \$150

Available with system purchase only.

Make the most of the new Acer CD-ROM standard with this special multimedia upgrade kit that includes: Sound Blaster and Business Audio-compatible 16-bit sound card; high-performance stereo speakers; Microsoft multimedia bundle with Works, Encarta™ Golf, Cinemania™ and SoundBits™.

CIRCLE 034 ON READER SERVICE CARD



Call 800-848-ACER

When calling, please reference #094 ACD

Monday through Friday 6 AM - 6 PM and Saturday 8 AM - 4 PM Pacific Time

Features	Acer	Dell
Manufacturer of most system component parts		
24 Hour Notebook Replacement Warranty		
International Travelers Warranty		
CD ROM in every system		
Free On Site Service With Every Desktop System		yes
18 years in the PC Business		
ISO 9002 quality certified		
24-Hr. Toll Free Tech Support		yes

A FULL YEAR OF ON-SITE SERVICE

Don't worry. If you have a problem with your Acer desktop system, we'll have a skilled service representative out to you in 48 hours—we promise.

Please call 1-800-848-ACER for details on the money-back guarantee, limited warranty and International Travelers Warranty. Return shipping and insurance charges are the responsibility of the customer. Not available in Canada. On-site service may not be available in certain remote locations. Products, availability, prices and programs are subject to change or cancellation without notice. Shipping and handling charges are extra. Acer, AcerAcros and the Acer logo are registered trademarks and AcerNote, AcerPower, AcerView, ChipUp and SmartCase are trademarks of Acer America Corporation and Acer, Inc. Intel and the Intel Inside Logo are registered trademarks and Pentium and the Pentium Processor logo are trademarks of Intel Corporation. All other brands and product names are trademarks or registered trademarks of their respective companies. ©1994 Acer America Corporation. All rights reserved.

AcerPower Pentium/90MHz

- Intel Pentium/90MHz Processor
- 16MB System RAM (Expandable to 128MB)
- 256KB Second-Level Cache
- 540MB IDE Fast Hard Disk Drive
- PCI Enhanced Local Bus IDE
- Panasonic 2X CD-ROM Drive
- 1.44MB Diskette Drive
- 2MB 64-Bit PCI Graphics Accelerator Card
- 17" .28mm Non-Interlaced Digital SVGA Color Monitor
- 2 PCI Expansion Slots, 4 ISA 16-Bit Expansion Slots
- 1 Combination PCI/ISA Expansion Slot
- Microsoft Windows for Workgroups, MS-DOS 6.2, Productivity/Entertainment Packs, Works for Windows, and Quicken Installed

\$3,395

\$124 A Month Business Lease

AcerPower Pentium/90MHz

- Intel Pentium/90MHz Processor
- 16MB System RAM (Expandable to 128MB)
- 256KB Second-Level Cache
- 540MB IDE Fast Hard Disk Drive
- PCI Enhanced Local Bus IDE
- Panasonic 2X CD-ROM Drive
- 1.44MB Diskette Drive
- 2MB 64-Bit PCI Graphics Accelerator Card
- 15" .28mm Non-Interlaced Flat Screen Digital SVGA Color Monitor
- 2 PCI Expansion Slots, 4 ISA 16-Bit Expansion Slots
- 1 Combination PCI/ISA Expansion Slot
- Microsoft Windows for Workgroups, MS-DOS 6.2, Productivity/Entertainment Packs, Works for Windows, and Quicken Installed

\$2,995

\$110 A Month Business Lease

AcerPower 486DX2/50MHz

- Intel 486DX2/50MHz Processor
- 4MB System RAM (Expandable to 64MB)
- 128KB Second-Level Cache
- 340MB IDE Fast Hard Disk Drive
- Panasonic 2X CD-ROM Drive
- 1.44MB Diskette Drive
- 14" .28mm Non-Interlaced Flat Screen Digital SVGA Color Monitor
- 1MB VESA Graphics Accelerator Card
- Microsoft Windows for Workgroups, MS-DOS 6.2, Productivity/Entertainment Packs, Works for Windows, and Quicken Installed

\$1,595

\$110 A Month Business Lease

AcerAcros 486SX/33MHz

- Intel 486SX/33MHz Processor
- 4MB System RAM (Expandable to 64MB)
- 340MB IDE Fast Hard Disk Drive
- Panasonic 2X CD-ROM Drive
- 1.44MB Diskette Drive
- 1MB VESA Graphics Accelerator Card
- 14" .28mm Non-Interlaced Flat Screen SVGA Color Monitor
- 4 ISA 16-Bit Expansion Slots
- Microsoft Windows for Workgroups, MS-DOS 6.2, Productivity/Entertainment Packs, Works for Windows, and Quicken Installed
- 128KB Cache Upgrade.....\$30

\$1,395

\$51 A Month Business Lease

Acer



EXPLORE the INTERNET!



FREE

DELPHI is the only major online service to offer you full access to the Internet. And now you can explore this incredible resource with no risk. You get 5 hours of evening/weekend access to try it out for free!

Use DELPHI's Internet mail gateway to exchange messages with over 30 million people at universities, companies, and other online services such as CompuServe and MCI Mail. Download programs and files using **FTP** or connect in real-time to other networks using **Telnet**. You can also meet people on the Internet. **Internet Relay Chat** lets you "talk" with people all over the world and **Usenet News** is the world's largest bulletin board with over 20,000 topics!

To help you find the information you want, you'll have access to powerful search utilities such as "Gopher," "Hytelnet" and "WAIS." If you aren't familiar with these terms, don't worry; DELPHI has hundreds of expert online assistants and a large collection of help files, books, programs, and other resources to help get you started.

Over 850 local access numbers are available across the country. Explore DELPHI and the Internet today. You'll be amazed by what you discover.

now supporting
**9,600
and
14,400
bps**
at no extra charge!

FIVE HOUR FREE TRIAL!

**Dial By Modem 1-800-365-4636, Press return until you get a prompt
At Username, enter JOINDELPHI. At Password, Enter PCMA949**

Offer applies for new members only. A valid credit card is required for immediate access.
Other restrictions apply. Complete details are provided during the toll-free registration.

Attention Current Internet Users: See what DELPHI can offer you! Stock quotes, Grolier's Encyclopedia newswires, and hundreds of other services are just a few keystrokes away. Telnet to delphi.com and enter the username and password above for a free trial.

*9,600 bps available in most local areas via Tymnet and Sprintnet. 14,400 bps available by dialing direct to Cambridge, MA.

DELPHI
INTERNET

Questions? Call 1-800-695-4005.
Send e-mail to INFO@delphi.com



Bill Machrone

The Technology Rift

We're in the midst of a great demographic upheaval. When the smoke clears, PC users will be in the majority. You might think this is a natural transition, but it's actually a dramatic shift. It will require societal adjustments, because some portion

of the technological have-nots will never make the leap to computer use.

We've been leading up to this major shift for the past ten years. In 1983, I used to cause a small ruckus when I used a laptop computer (a Radio Shack Model 100) in public, as in airports or on mass transit. Now, as I look up and down the aisle of the 757 I'm riding, I can see a dozen notebook machines. On another occasion, I remember sitting in a San Francisco deli in 1984 as two women at the next table spoke dBASE to one another. This was remarkable enough at the time that my colleagues and I struck up a conversation with them. Today, people talking about PCs and their applications are commonplace.

NOT UBIQUITOUS...YET

Lots of people still don't use PCs, though. Obviously, some people simply have a lack of funds or a lack of opportunity—but for others, it's a matter of perverse pride. A young doctor I know fairly beams with pleasure as he tells me that he doesn't use a PC. As far as he's concerned, PCs can't do anything for him, and he isn't even slightly interested in finding out what their potential might be. Interestingly, his wife (also a physician) uses computers and thinks they're just fine. He says he might get one for the kids, though, now that they're getting to the age where they can play games and such.

Doctors, as a group, tend to be technically oriented. Indeed, many are downright gadget freaks. Perhaps the Young Doctor doesn't want to be associated with his gadgeteering peers. Frankly, I have no sympathy for his position and can't understand why anyone would *choose* ignorance over knowledge. Eschewing personal computers in this day and age is

like saying "no thanks" to refrigeration.

In stark contrast, I know a dedicated teacher who works at an inner-city elementary school. She teaches art, is working toward her master's degree, and commutes a fair distance to work each day. Until recently, she hasn't had the time or the money to get into computers.

A couple of weeks ago, she told me she was thinking about getting a computer and asked me what I recommended. I told her that a laptop would probably best fit her life-style and asked her the usual questions about whether she wanted a system compatible with the Macintoshes in the computer lab at school or whether she preferred to be compatible with the DOS/Windows world. There was an embarrassed silence, and she asked, "What is Windows, anyway, and how come I never see them advertise it for the Macintosh?"

After I explained the intricacies of the major graphical operating systems and the fundamental differences between PCs and Macs, I realized that I was shocked that a young adult professional wasn't conversant with these issues. Upon reflection, however, I realized the plain and simple truth: She *hadn't* had the time in the past several years to delve into the complexities of PCs.

IGNORANT LOUYS?

Then there's the myth of Joe Six-Pack. Conventional wisdom would have us believe in a cartoonish, ignorant lout who would need surgery to extract the remote control from his hand and who marks the passage of the seasons by the play-off games on TV. The information highway supposedly doesn't go past Joe's house.

Let me tell you something about Joe. He may not care much about PCs, and he's probably never heard



*Personal computers
are making the world a better
place—for most of us.*

Send your message around the world...



...and celebrate its return.

**PC Magazine has
Licensed Editions
all over the world.**

By advertising with the
most trusted name in
computer publishing,
you can open new markets
and conquer the world.

For information on these
foreign editions, contact the
Ziff-Davis Licensing Department:

Tel: 212-503-5422

Fax: 212-503-5420



Bill Machrone

of most of the things that are grist for our everyday conversations. But Joe has a couple of kids, and he wants the best for them. So he's likely to be found down at Price Club, racking up his Visa account so that his kids will have a fighting chance in school and in the job market. Hey, who do you think has been buying all those Packard Bell PCs? Twelve-year-olds?

There are lots of jobs out there that remain out of the realm of the information revolution. That they are not information-intensive doesn't make them any more or less important or valuable; it just makes them different. In fact, you'd be wrong to think of these jobs as completely divorced from information. The real difference is that computer users manipulate information actively, while nonusers consume it passively.

BRIDGING THE GAP

The question is whether we as a society will be able to bridge the gap between the two. After you've used on-line reference materials, it's pretty hard to go back to leafing through musty volumes. I'm not turning anti-book. Reading and browsing are wonderful pastimes, but we seldom have the time or patience to enjoy the process when we're on a quest for information. People who don't have access to digital tools work far harder to achieve less.

The more I think about this, the more sympathy I have for projects that provide information access and e-mail to the economically disadvantaged. Even more important are the budding services that provide basic phone and voice mail services to the homeless. How are they ever going to get a job if there's no place for a prospective employer to leave a message? How do they keep in touch with loved ones? How do they reintegrate themselves into society without this crucial link?

The challenge will be to achieve coexistence among active users, passive users, and nonusers. If you're on the winning side of the information revolution, it's easy to feel comfortable and smug while the other side is marked by incomprehension of a world that's suddenly become far more complex. You've been used to being in the minority. Being in the majority also entails responsibilities for the welfare of the entire social organism. Will you be magnanimous in victory? □

Step into the Future with Everex STEP Note



Built-In Upgradability

Four steps to the perfect portable:

Step 1 - upgrade the CPU from 486SX-33 through IDX2-50 to Intel DX4-75

Step 2 - upgrade the display from mono STN through color DSTN to TFT

Step 3 - upgrade the removable hard disk from 120MB through 250MB and 340MB to 514MB

Step 4 - expand your options with fax/modem, Ethernet, SCSI and other PCMCIA cards

Road Ready Multimedia

Integrated digital audio chip set and sound generator lets you record, compress and play back. The Everex STEP Note includes built-in speaker and microphone, plus a jack for external ones.

Reliability & Service

The Everex STEP Note carries on the Everex tradition of reliability. We also include a 2 year warranty for additional peace of mind.

486SX mono starts at \$1,495.

486SX color starts at \$1,995.

Intel DX4-75 TFT starts at \$3,495.

CIRCLE 090 ON READER SERVICE CARD

Call 1-800-EVEREX4 (1-800-383-7394) for the location of the dealer nearest you.

5020 Brandin Court
Fremont, California 94538
Fax (510) 683-2186

EVEREX
EVER for EXcellence™

MICROSOFT
WINDOWS
NT.

Energy
ALLY



The Intel Inside logo is a registered trademark of Intel Corporation. All other trademarks used herein are the property of their respective owners.

THE NEW PREMMIA™ GX. It merely starts with Intel's Pentium™ microprocessor, in two speeds, the fastest and very, very fast. In other words, 100 MHz and 90 MHz.

From there, AST engineers

raised the bar, and the new Premmia screamed right by the Compaq Deskpro and HP Vectra to 112 million WinMarks* of graphics performance. With dual 100 MHz CPUs and the fastest cache system ever, just imagine

what you could do.

You could actually do more than two things at once. That is what your boss has been asking for all along, right? Suppose, for instance, you are designing a suspension bridge. You could rework the center span drawings while

**IT'S THE FASTEST PERSONAL COMPUTER THERE IS,
GIVE OR TAKE A NANOSECOND.**



And less time fiddling with your computer setup. Whatever you're doing, security features will help protect your most sensitive data and corporate secrets. Who knows? You

might be able to accomplish ten hours of number crunching in five, and catch an early commuter train home in time to see your Little Leaguer whack one out of the park.

Of course, the Premmia comes

with expert backup, starting with a 3-year limited warranty.

Our network of over 6,000 resellers will help you with your purchase and stick with you afterwards, too. Every day, 24 hours a day,

calculating load and stress numbers
at the same time.

That's not all. The Premmia GX
is affordable like a personal com-
puter. But with a whole array of
innovative features, it actually per-
forms like a true workstation.

All the newest 32-bit operating
systems are supported. Integrated

Ethernet is already built right in.

And there's no faster way to con-
nect peripherals like a hard drive
or a scanner than with the GX's
integrated FastSCSI-2 controller.

Still, we're not simply talking
speed for speed's sake. It all adds up
(quite quickly, we might add) to a
better way to work. With desktop
management features, you'll spend
more time focusing on important
reports and presentations.



our own extra responsive telephone
support group is here to help.
Would you expect anything less from
the world's fifth largest personal
computer manufacturer?*

personal computer (or call it a
workstation) you'd like on your desk?
In a blink. A snap. A flash. A
heartbeat. A nanosecond. So why
don't you hit speed dial and call
us at 800-876-4AST.

Well, then, is this the kind of

YOU'LL LIKE THE WAY WE WORK™

Premmia GX

Pentium 90 & 100 MHz, dual
processor capable, OverDrive™
Ready. PCI and EISA.
256KB Synchronous Burst
Mode cache. 64-bit PCI local bus
graphics card. 2MB VRAM
upgradable to 4MB. Supports
up to 1280 x 1024 x 16.7
million colors non-interlaced.
Integrated PCI local bus FastSCSI-2
controller. Integrated Ethernet.
Type III PCMCIA capability.
Plug-n-play capable. DMI support.
Energy managed.

Premmia MX

Pentium 60 MHz, IntelDX4/100
or 486DX2/66, OverDrive
Ready. PCI and ISA.
Pentium models: 256KB cache.
486 models: 256KB cache on hard
drive models, 64KB or 256KB
options on base models.
64-bit PCI local bus graphics card.
2MB VRAM upgradable to 4MB.
Supports up to
1280 x 1024 x 16.7 million colors
non-interlaced. Type III PCMCIA
capability. Plug-n-play capable.
DMI support. Energy Star.

AST.
COMPUTER



The ZEOS® Ambra™ The Optimal Network or Home PC.

ZEOS Ambra computers are not just another line of systems. They're the ideal solution to your network or home needs.

Why ideal? The ZEOS Ambra is loaded with hearty features in a slim case. We give you a choice of Intel processors—from 486SX-25 to 486DX2-66. You also get on-board local bus video, and enough bays to add a CD-ROM, 5.25" floppy drive and tape backup. The best news: all this is available at a lean price that will leave a little green in your pocket.

Speaking of green... ZEOS Ambra computers are green—meaning they use less energy. Why should you care? Because Ambra PCs cut down on pollution and lower your electricity bill. That can translate into big savings for you and your company!



To save you even more money, we lowered prices *and* offer you several money-

saving packages (many ready to ship the day you order) or the option to custom build a system to your exact needs. If you need a diskless workstation, we can even remove the hard drive and floppy disk drive, and install a network card.

What's more, the Ambra is 100% compatible with all major operating systems on the market.

You also get award-winning after-the-sale support. No company has won more *PC Magazine* Readers' Choice for Service & Reliability awards than ZEOS—six in all!

Whether it's connected to your network or plugging away at the home office, the ZEOS Ambra is the optimal solution for all your word processing or spreadsheet needs. It's the little powerhouse with a big punch at an exceptional value. Call a ZEOS Systems Consultant today at 800-554-7172.



Standard With Every ZEOS Ambra System:

- Genuine Intel 486 microprocessor.
- Intel's Pentium OverDrive upgrade socket.
- 128K SRAM cache.
- Two serial ports, one parallel port and one mouse port integrated.
- Five expansion slots: two VESA local bus and three 16-bit ISA.
- Small footprint case with four bays.
- System speed selectable through the keyboard.
- 200 watt power supply, switchable between 115/230V.
- ZEOS 101-key space-saving keyboard.
- Password feature built-in ROM for security.
- EPA Energy Star compliant.
- FCC Certified Class B; UL listed.
- ZEOS Customer Satisfaction Package.



Package 1

486SX-25	\$1195
486DX-33	\$1395
486DX2-50	\$1395
486DX2-66	\$1445

- 4MB RAM
- 214MB IDE hard drive, 32K cache
- 3.5" 1.44MB floppy drive
- On-board VESA local bus SVGA color video
- ZEOS 14" 1024 x 768 NI SVGA color monitor, .28mm dot pitch
- MS-DOS 6.2, Windows for Workgroups 3.11, Microsoft Mouse

Package 2

486SX-25	\$1395
486DX-33	\$1595
486DX2-50	\$1595
486DX2-66	\$1645

- 8MB RAM
- 340MB IDE hard drive, 128K cache
- 3.5" 1.44MB floppy drive
- On-board VESA local bus SVGA color video
- ZEOS 14" 1024 x 768 NI SVGA color monitor, .28mm dot pitch
- MS-DOS 6.2, Windows for Workgroups 3.11, Microsoft Mouse

800-554-7172
**24 Hours
a Day**



Fax Orders: 800-362-1205 or 612-362-1205 Phone Orders: Outside U.S. and Canada: 612-362-1212, Government: 800-245-2449. ZEOS Information Systems, Inc. GSA #GS00K94AGS5176. Purchase Orders, MasterCard, VISA, Am Ex, Discover, COD and affordable leasing programs.

Purchase orders are subject to approval. Business leasing programs available. Lease prices based on a 36-month lease, 10% purchase option. All prices, specifications and availability are subject to change without notice; call to confirm these and warranty details. Prices do not include shipping. Novell compatibility is Developer Tested Only. Novell makes no warranties with respect to this product. The Energy Star emblem does not represent EPA endorsement of any product or service. All products and company names are trademarks or registered trademarks of their respective holders. Intel Inside is a trademark of Intel Corporation. ZEOS is a registered trademark. Computers Now! is a registered servicemark. Ambra is a trademark of ZEOS International Ltd. © 1994 ZEOS International Ltd., 1301 Industrial Blvd., Minneapolis, MN 55413 USA. ZEOS is a publicly traded company (NASDAQ symbol: ZEOS) AIB-PCM-9409B



John C. Dvorak

The Impending CD-ROM Fiasco

The concept of a CD-ROM that works in only one operating environment is a time bomb waiting to explode. Just imagine that the CD-ROM software we're buying today at \$49 to \$99 will be useless in the near future. CD-ROM technology has got to

stabilize so that the projected 50 to 100 million CD-ROM drives on desktops in 1998 will be capable of reading CD-ROMs made in 2010.

But I'm getting ahead of myself. Let me back up and describe the problem. CD-ROM programs written for Microsoft Windows 3.0 (or 3.1 or OS/2 for that matter) work only under those environments and can't cross the operating-system border. I'm annoyed by the CD-ROMs in my collection that display the message, "Requires Windows 3.0 to operate." Has anyone ever heard of backward-compatibility?

BACKWARD-COMPATIBLE?

The CD-ROM medium has introduced a new category of software called *contentware*, or content-specific software. The marketplace perceives content-oriented CD-ROMs as books with sound bites and pretty pictures. When you buy a book, do you expect it to become obsolete when your eyeglass or contact lens prescription changes? No. Then why should a Windows CD-ROM not work on the newest version of Windows?

Take Microsoft Bookshelf, one of the finest CD-ROMs on the market. For \$99 do I get to keep the dictionary and reference books for the rest of my life just as if I had purchased the book versions? Well, I checked my 1991 and 1992 versions of CD-ROMs written for Windows 3.0, and they worked fine in Windows 3.1. Many other content-specific CD-ROMs in my collection, though, are not universal and require an older version of Windows. Besides, animation and sound coordination stink on many disks. This just doesn't cut it.

Can you imagine if the specification for audio compact disks changed every year or two? Your entire collection of James Brown

couldn't be played on your new CD player, and you'd have to start your collection over again! I can hear the record-company executives saying, "Oh, this year's compact disks sample 24 bits of data for more fidelity—so dogs can hear the new sounds." The catch: The new disks won't work on old players. Obviously, the consumer market would reject these useless upgrades.

DUMB PRODUCT, SMART MARKET

The last attempt to introduce a new CD spec was the CDV, which included a few songs along with several minutes of MTV-type video. I went to the rollout of this dog and was stunned by the number of industry types who were buying the idea hook, line, and sinker. The market isn't as dumb as the marketers, and the idea was soundly rejected.

I've suffered through the transition from vinyl records to compact disks—paying rip-off prices on CDs to renew my collection—and now dread the idea of doing it over and over and over again with CD-ROMs. My solution: All CD-ROM developers should make combination disks that work on all platforms. Granted, there are many Macintosh/Windows combo disks on the market today

that use the same database, but they use different front ends. These disks will be useless as the operating systems change and the front ends no longer work. In my solution, the CD-ROM serves as the storehouse for data. Period. The front-end access programs reside on the computer's operating system, so if the operating system changes, you just get a new front end that operates the old disks.

We may want to temper our enthusiasm for the medium. Something needs to be done before the CD-ROM scene heads toward the brink of disaster.



*Can you imagine replacing
your entire James Brown collection
every few years?*

IF YOU'RE LOOKING FOR THE VERY BEST IN NOTEBOOK COMPUTING, MPC'S SOLUTION IS AS SIMPLE AS 1,2,3.



LCD STATUS INDICATOR
CONVENIENTLY DISPLAYS KEY LAPTOP
FUNCTIONS—INCLUDING BATTERY
LIFE AND POWER MANAGEMENT

1
ONE EXTRA PCMCIA SLOT. WHILE
OUR COMPETITORS INCLUDE ONE
PCMCIA TYPE III SLOT, WE GIVE
YOU A TYPE III PLUS AN EXTRA
TYPE II SLOT (PCMCIA TYPE IV),
ALLOWING YOU INSTANT FAX,
MODEM, NETWORKING AND OTHER
CAPABILITIES.



2
TWO-BATTERY TECHNOLOGY. MPC NOTEBOOK
COMPUTERS GIVE YOU AN EXTRA BUILT-IN BAT-
TERY, SO YOU DON'T HAVE TO SHUT DOWN AND
RE-BOOT. SIMPLY SLIDE OUT THE DISCHARGED
BATTERY AND HOT-SWAP A FRESH BATTERY IN,
WITHOUT INTERRUPTING YOUR WORK.



**STARTING AT
\$1999
DX4-75**

DUAL-SCAN, 4MB RAM AND
120MB HDD

**NEW
DX/4
CPU**

UPGRADEABLE CPU LETS
YOU EXPAND YOUR COMPUT-
ING POWER AS YOUR PERFOR-
MANCE NEEDS CHANGE



3
**3-VOLT DESIGN MEANS LESS
POWER CONSUMPTION, PROVIDING
MORE OPERATING TIME, LESS
HEAT AND GREATER RELIABILITY.**

MPC Technologies, Inc., offers a complete line
of high end notebook computers providing you with
fully upgradeable systems, the latest technology and
complete multimedia options.

MPC products incorporate ergonomic features

and power management.

The latest technology is
offered in the new 700 and 800
Series, featuring the DX2-50/66,
the new DX4-75 and DX4-100

700 SERIES SPECIFICATIONS

- DX2-50, DX4-75 or 100 MHz
- 8MB RAM, max. 32MB, EMS 4.2 support
- 15" 1.44MB FDD
- 340MB, max. 540MB HDD (removable)
- 9.5" color dual scan TFT LCD
- 1MB Video Local bus
- VGA port support 1024x768x256 color
- New PCMCIA IV slot, support I type II & I type III
- Built-in 19mm extra large center-track ball
- Built-in 16-bit business sound system
- True 3.3Vdc system
- Advanced SMI power management
- System status panel
- Upgradeable LCD screen
- NiMH battery with hot-swapping features
- I/O parallel, serial, VGA, audio/video docking connector
- Built-in microphone
- MS-DOS
- 5.7 lbs., including battery pack

for all the comfort of full sized desktop systems.
There's a built-in palm rest and responsive center
trackball; and there's an LCD display that monitors
important notebook functions including battery life

processors with built-in sound
and CD ROM capability.

700 and 800 Series
Monochrome, Dual Scan color,
and Active Matrix systems offer
full CPU upgradeability.
Upgrade options are available so you can
expand memory or hard drive capacity.
Feature for feature MPC delivers
the best value in notebook solutions. Let

MPC BASIC	
750 486DX2-50 MONOCHROME 4MB RAM, 260MB HDD	\$1,699
750 486DX2-50 DUAL SCAN 8MB RAM, 340MB HDD	\$2,479
775 486DX2-75 DUAL SCAN 8MB RAM, 340MB HDD	\$2,699
775 486DX4-75 TFT ACTIVE 8MB RAM, 340MB HDD	\$3,500
MPC BUNDLE	
WITH WINDOWS FOR WORK GROUP, PCMCIA 14.4 FAX/MODEM CARD, CAR ADAPTER & MPC CARRYING CASE	
750 486DX2-50 DUAL SCAN 8MB RAM, 340MB HDD	\$2,689
775 486DX2-75 DUAL SCAN 8MB RAM, 524MB HDD	\$3,269
775 486DX2-75 DUAL SCAN 16MB RAM, 524MB HDD	\$3,429
799 486DX2-100 TFT ACTIVE 16MB RAM, 524MB HDD	\$4,499
MPC DELUXE	
WITH WINDOWS FOR WORK GROUP, PCMCIA 14.4 FAX/MODEM & 2 IN 1 ETHERNET CARD, CAR ADAPTER & MPC CARRYING CASE	
799 486DX4-100 DUAL SCAN 16MB RAM, 524MB HDD	\$3,699
799 486DX4-100 DUAL SCAN 24MB RAM, 524MB HDD	\$3,999
799 486DX4-100 TFT ACTIVE 24MB RAM, 524MB HDD	\$4,999
799 486DX4-100 DUAL SCAN 32MB RAM, 524MB HDD	CALL



NEW!

CD-BOOK
THE COMPLETE COLOR
MULTIMEDIA PORTABLE, WITH
4MB/340MB FOR ONLY

\$3499

**24
HOUR
SUPPORT**

one of our skilled sales consultants help you deter-
mine which MPC System is right for you. MPC
Technologies, 2915 Daimler St., Santa Ana, CA
92705. Local: (714) 724-9000. (800) MPC-8088.
Fax: (714) 724-9648. BBS: (714) 724-1519.

800 SERIES SPECIFICATIONS

- DX2-66, DX4-75 or 100 MHz
- Built-in double speed CD-ROM supports 5.25/73%
- Free Life Style CD Pack (4 CD's) recipes, games, gardening and national parks
- 4MB expandable to 20MB
- 9.5" Dual Scan & TFT Active LCD screen
- Accelerated 32-bit VESA Local Bus VGA with 1MB
- 1024x768x256 color/simultaneous display on LCD & external monitor
- Built-in pointing device (Versa Point)
- PCMCIA Type III slot
- 16-bit stereo (Sound Blaster compatible)
- NiMH battery
- Advanced power management
- Built-in microphone & stereo speakers
- I/O parallel, serial, VGA & audio/video
- DOS & Windows for Work Group
- Carrying case
- 6.6 lbs. (18) with battery

1-800-672-8088



Terms: No sub-charge for MasterCard or Visa orders. Purchase orders accepted from approved corporations, government institutions and universities. MPC pricing subject to change without notice. All trademarks and registered trademarks are of their respective companies.

CIRCLE 177 ON READER SERVICE CARD

John C. Dvorak Inside Track

So the industry is abuzz about the **Microsoft victory** over the U.S. government and all of Microsoft's whining competitors. The Justice Department handed down a ruling saying that Microsoft must change its licensing practices. This was hardly punishment, but it does end a **vile** practice. In essence, Microsoft had PC makers over a barrel by requiring them to buy a DOS license per system unit. In other words, if Compaq or Dell wanted to license DOS (and how could they possibly survive without licensing DOS?), they had to take a license for each CPU whether it was sold with DOS or not. This meant that if you wanted to buy OS/2 on your computer, Dell—for example—would still have to pay Microsoft for a DOS license. This also meant there was **no incentive** to sell anything but DOS, since it was already part of the price. This effectively locked out everyone.

This decision is **too little too late**. DOS and Windows are so established that the elimination of the Microsoft license is meaningless. It's like agreeing to stop using nuclear weapons after already blowing up the world. The fact that this was essentially all the Justice Department did means that **nothing will change** unless Chicago turns out to be a big flop. It also **throws down the gauntlet** to Novell, whose top executive said that if something isn't done about Microsoft, Novell will start to use Microsoft business practices—whatever that means.

Let's face it, Microsoft is in the **driver's seat**, and there's absolutely nothing anyone can do about it at this point. This kind of **dominance** usually results in a backlash, but the fact is that most users are quite content with Microsoft products and service. The big question is whether Chicago will be all that it's cracked up to be. If it's not, then people may begin to look elsewhere. Elsewhere is IBM, which is working feverishly on its PowerPC strategy, and Taligent, the be-all-end-all product that's taking forever to finish.

Taligent began as Apple's next-generation object-oriented operating system dubbed "Pink." When IBMers were showing off their wares to Apple executives one day, the Apple people pulled out Pink and **stunned the IBMers**. In exchange for allowing IBM to join the Taligent team, Apple was allowed to join the PowerPC team. This is why Apple is listed as a partner with Motorola and IBM in this PowerPC hardware venture.

As the story goes, once IBM got on-board, **things began to go downhill** as IBMers kept mucking with

*Microsoft had PC makers
over a barrel by
requiring them to buy a
DOS license per system unit.
This meant vendors
had no incentive to sell
anything but DOS,
since it was already
part of the price.*

the feature set of Taligent. At the same time, Apple and IBM were collaborating on a **futuristic** multimedia hardware venture called Kaleida. This venture hit a brick wall because the two companies could not work well together. Taligent was further along when IBM got involved, so it's managed to stay afloat. Anyway, instead of letting the experts finish the product, IBM got too involved with nit-picking. Gertsner has not been able to do anything about this aspect of IBM culture.

IBM is also **shooting itself in the foot** with the PowerPC mess, as still another joint venture with Apple is potentially ruining the opportunity for a platform shift. This is over the PREP (PowerPC Refer-

ence Platform). The idea behind this thing is to create a new architecture where IBM and Apple and most of Taiwan all make **machines** that can run AIX, OS/2 (Workplace OS), System 7.5, Windows NT, or whatever. Apple is said to be tired of IBM's stalling and has established the PREP-standard machine on its own, figuring IBM will never be able to decide on anything without a **million committee meetings** and tons of memos. Most of the debate stems from whether to **include an IDE port** on the system. Apple sees it as redundant since the SCSI-2 can do all the things the IDE can do and more. IBM wants both just in case someone asks. IBM should again let Apple do the work and go along with the program.

Meanwhile, IBM continues to lead the pack in research developments. This is especially true with hard disk technology and the vaunted magneto-resistive head. The **latest gizmo** is called a **spin-valve head**, which IBMers say will increase disk storage capacities twenty-fold to over **10 billion bits of data per square inch**. We always have to remember that almost all the hard disk technology in use today stems from IBM's invention of the Winchester drive. It's a quirky company, isn't it?

The Beat Goes On Dept.: I was amused when market researchers at Dataquest predicted another RAM shortage to occur sometime in 1995. This happens every two or three years and is incredibly annoying. It results in a price increase and a general industry slowdown. The last shortage was a short-lived panic caused by the **explosion** of the epoxy factory that made the glue to stick semiconductor chips to their plastic bases. This shortage will supposedly result from the fact that the typical computer system will now have 8MB instead of 4MB. Heck, I've been telling people to load up on 32MB and have some fun. Now may be the time to think about **loading up**. □

In all respects, it's a

WIN
“Outstanding”
level of performance...
go
a



On June 28th, PC Magazine announced its Editors' Choice Awards. We'd like to thank them for making the HP Vectra XU PC a winner, and for doing an excellent job of writing this ad. For additional reading materials, call us today at 1-800-322-HPPC, Ext. 8518.

“The HP Vectra XU PC is a

**power
user's
dream”**

*“most
advanced
design
of any system...”*

**generation
ahead**
of the pack”

Believe everything you read.



**HEWLETT
PACKARD**

Introducing ripping fast graphics acceleration.

Diamond's Stealth 64 graphics accelerators, available in VRAM and DRAM versions, combine streamlined graphics with high-performance 64-bit processing power. Our lean, clean and incredibly mean approach has paid off with flying colors. With curve-smashing scores in benchmarks and real-world applications. And a list price starting at only \$229 — considerably less than the competition.

Diamond's true-color Stealth 64s have pure pumped up 24-bit color

DOS	WINDOWS
5846.7	43
578	38.4

performance. Turning out up to 1280 x 1024 high-resolution graphics for

sharp, clear images. And supporting both PCI and VESA Local Bus. In addition you get Diamond's InControl Tools™ for ease-of-use plus the drivers to run on most popular operating systems.

"Stealth 64 'VRAM' blazes in every Windows and DOS application...two thumbs up for excellence in every category ..."

- Greg Loveria, BYTE Magazine, July 1994.

So, don't be ruled by weak-kneed performance. Get Stealth 64 from Diamond. Call **1-408-736-2000** or our 24-hour FAX-Back service at **1-800-380-0030** for a dealer near you.

DIAMOND

Computer Systems, Inc.

1130 East Arques Avenue, Sunnyvale, CA 94086

Stealth 64.

All Muscle.

No Fat.





Jim Seymour

That Movable Feast: The Sweet Spot

Rules of thumb are a dime a dozen in the PC business—and pretty much everywhere else in life, too, it seems to me. We like quick tests for determining whether something is right or wrong, big or small enough, fast or slow enough. But rules of thumb

are just that—rough estimates, quick approximations. And they change over time, though we often fail to notice the change . . . in time.

One of the classic rules of thumb in the PC world is the notion of a *sweet spot* for PC buyers—that just-right, insiders-all-agree, you-won't-be-sorry combination of price, parts, and performance that marks the smartest PC buy at any given moment.

In our Perfect PC issue just two months ago (July 1994), we gave readers a comprehensive analysis of the PC-buying sweet spot of the moment. Editor-in-chief Michael J. Miller and a crew of *PC Magazine* regulars drew up the specs for several different levels of PCs, from the all-out dream machine down to the entry-level econobox.

But we got sandbagged by the incredible pace of change in this business. This summer's sharp price cuts for Intel microprocessors rippled through to actual selling prices for complete PCs in record time. As a result, those carefully crafted price/performance points of July would look very different were we compiling them today.

Which is the biggest problem with sweet spots in this business: They're fast-moving targets.

Besides, as useful as that set of comprehensive specs was, many PC buyers still see the CPU chip as the first and most important element in picking a new computer. That isn't such a bad idea: Major PC vendors are doing a more responsible job of matching components. We rarely see mainstream PCs with fast processors saddled with just 2MB or 4MB of RAM; doggy, limited-capacity hard disks; or creepy-slow video cards anymore.

TODAY'S CHOICE

Let me take an updated and highly biased pass at today's

sweet spot, focusing on the CPU chip as the defining element. I'll focus on desktop machines; mixing in notebooks and servers is too messy. And remember that everything I say now will be obsolete in just a couple of months.

Yesterday, PC cognoscenti agreed that the sweet spot usually lies one notch down from the latest and greatest. Buy one step back from the precipice and you'll get the most bang for the buck.

Today that's still true, at least for some buyers. But confusion about classes of chips and a lack of foresight about what's coming in PC applications continue to hobble some buyers.

More often than not, in my experience, people buying PCs for home use buy too low, not too high, on the scale; this happens often enough in even the largest corporations that I won't let business buyers off the hook, either. Spending 20 percent too little is a bigger curse than spending 20 percent too much: You quickly become disenchanted with your purchase, which means you wasted 100 percent of your money.

Let's define two simple classes of PC users: low-level and high-level. That's not a home/business split; indeed,

with today's power-hungry games and CD-ROM applications, the home PC user may want and really need more juice than the office worker who's only juggling memos and spreadsheets.

Now for the controversial part: Both classes of users need Pentium-equipped PCs. Nothing less. And I'm not kidding.

THE TWO PENTIUMS

Though many people continue to speak of Pentiums as if they were in a single class of price and performance, we now have two very different Pentium chips—and, of course, two different types of



The sweet spot for PCs moves so quickly that the advice we gave you two months ago is now obsolete.

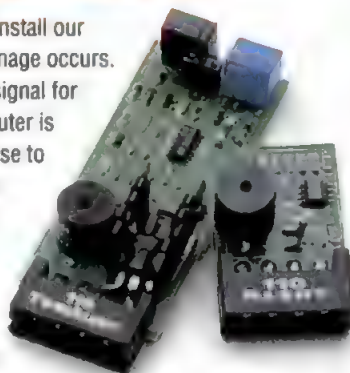
PC FAN FAILURE IS ALARMING.

Now, for only \$39, your computer can have 3-way thermal protection:

- 1. Loud audible alarm warns you if temperature hits 110°F.**
- 2. Signal for optional remote monitoring given at 110°F.**
- 3. The computer is automatically turned-off at 118°F.**

Don't let PC fan failure cost you your system! Install our **110 TwinAlert** to detect overheating *before* damage occurs. At 110°F you'll get a loud audible alarm and a signal for optional remote monitoring. And, if your computer is unattended and the temperature continues to rise to a dangerous 118°F, the **110 TwinAlert** will save your machine by *safely* shutting-off its power! The inexpensive **110 TwinAlert** is compact, easy to install, and works in any computer.

110 Alert™ (audible alarm only).....\$19.00
110 TwinAlert™ (all features).....\$39.00



PC POWER & COOLING, INC.

5995 Avenida Encinas, Carlsbad, CA 92008, (619) 931-5700, (800) 722-6555, Fax (619) 931-6988

*Not available in IL, CO, HI or on approved resellers. ©1994 PC Power & Cooling, Inc. All rights reserved.

CIRCLE 080 ON READER SERVICE CARD

Jim Seymour

PCs using those chips. The original 60-MHz and 66-MHz Pentiums released last year are history in terms of leading-edge technology. These older, slower chips have no clear upgrade path; they use older, hotter 5-volt technology and are built with older production techniques. But boy, you can get some great buys right now on machines still using them.

Intel's virtual fire sale on old Pentium chips this summer has been amazing. Successive price cuts have dropped these original Pentiums to levels far lower than we're used to seeing so early in the life of relatively new Intel designs. By early August, Intel was selling 60-MHz chips for just \$418 each in quantities of 1,000.

That has led to a bargain buyer's delight—Pentium machines for under \$2,000. Many of these aren't stripped, either: They have 8MB of RAM, decent-size hard disks, good video, and okay monitors. Many even include double-speed CD-ROM drives.

Those are the machines low-level PC users at home or in business should be buying right now—not DX2s, not DX4s (a chip without a future), and certainly not older, slower CPUs.

INVEST IN THE FUTURE

Everyone else? Go for 90-MHz Pentium machines. These are already selling for astonishingly low prices; you can buy many 90-MHz machines for under \$3,000 in solid configurations. These boxes have a great future, with a serious processor-upgrade path, typically very good video, and more RAM-expansion capacity than you need. Most come with a 500MB IDE drive; insist on Enhanced IDE and spend another \$300 or so to move up to a 1GB hard disk. It sounds huge today, but you'll be sending me gushy thank-you letters by this time next year.

Consider spending another couple of hundred bucks for a 17-inch monitor rather than settling for the 15-inch unit usually bundled with under-\$3,000 90-MHz Pentiums. Ditto on the love letters.

Forget about 100 MHz for now. Intel can't make meaningful quantities of the 100-MHz chip yet, and the difference in performance isn't worth worrying about.

I know this runs contrary to Intel's orderly, multistep a-chip-for-everyone charts. Forget that: Buy Pentium and feel smart. Not just today but next year, too. □

IF FINDING MISSING CHILDREN WERE THIS EASY, WE WOULDN'T NEED YOUR HELP.

Missing children don't advertise themselves. In fact, since the majority of them are abducted by a parent, they might not realize they're "missing" at all. That's what makes our job tougher, and why we're asking for your help.

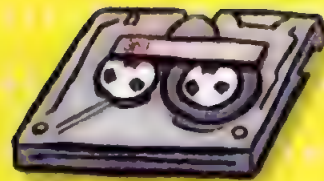
In your professional capacity, you might be able to identify an abducted child, or a parent who may have abducted a child. If so, please contact Child Find of America. Or ask the parent to call us for confidential mediation. Our toll-free hotline is 1-800-A-WAY-OUT. It could just be the way out they're looking for.



CHILD FIND OF AMERICA INC.



The path to follow whichever storage option you choose.



5 GB-Magnus™
Data Cartridge

5 GB-8mm
Data Tape



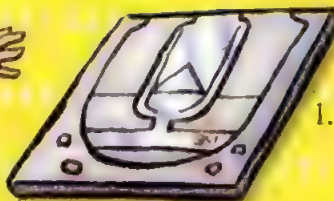
2.4 GB-ECart™
1/2" Tape Cartridge



2 GB-4mm
Data Tape



1.3 GB-Rewritable
Optical Disk



255-750 MB-MC3000
Minicartridge



1.44 MB-High Density Formatted Diskette



Whatever capacity you need, whatever technology you choose, 3M has a proven, reliable solution. In fact, users rate 3M brand diskettes and quarter-inch cartridges number one in reliability—and overwhelmingly prefer them over other brands. So whether it's our enhanced performance diskette, Rewritable Optical, 4mm or 8mm data tapes, ECart™ 1/2" tape cartridge or the multi-gigabyte capacity of quarter-inch cartridges—we're ready to grow with you. That's why more businesses protect important information on 3M brand data storage products than any other brand in the world. Find out more. Call 1-800-888-1889, ext. 1004.

3M data storage products require compatible drives. "ECart" and "Magnus" are trademarks of 3M. Preference and reliability ratings based on independent research.
© 3M 1994

3M *Reliability*

CIRCLE 910 ON READER SERVICE CARD

.....the..... Expert's Choice

The Critics Rave

Hardly a month goes by when a Micron PC doesn't pick up a new award or citation: recently, Micron's P90PCI Powerstation earned *PC Magazine's* prestigious Editors' Choice Award and Micron's superb reputation earned them *PC Magazine's* Readers' Choice Service & Reliability award. *PC WEEK*, *Byte*, *PC World*, *Windows Sources*, and others have also cited Micron for technical excellence and exceptional value.



The Editors Marvel

"The system's components and general design dazzled,"—*PC Magazine* June 28, 1994. The P90PCI PowerStation outscored all of the competition—including Dell and Zeos Pentium PCs—in the Winstone 94, Disk Winmark and Disk benchmark tests. This was no surprise, however—in the April 26th issue, *PC Magazine* also ranked the Micron P90PCI above all the competition in key benchmark tests.

The High-Performance/Value Leader

As a fully integrated manufacturer of semiconductors and components, Micron can offer the latest configurations at the lowest prices, and still provide outstanding customer service and technical support. "If value is paramount, the Micron P90PCI offers all you'll need in higher order computing,"—*PC Magazine* June 28, 1994.

MICRON
COMPUTER, INC.

Order Now
800-388-6334



July 1994



June 28, 1994
POWERSTATION



April 26, 1994
MAGNUS



January 26, 1993
MAGNUS



June 27, 1994
POWERSTATION



December 1993
WINSTATION



December 1993
WINSTATION



**PENTIUM
90MHz**



**PC
MAGAZINE
EDITORS'
CHOICE**

June 28, 1994
Micron P90PCI
PowerStation

"...the Micron P90PCI combines an excellent design with quality components to create a powerful Windows machine."

PC Magazine 6/28/94

**PCWEEKLABS
ANALYST'S
CHOICE**

June 27, 1994
POWERSTATION

P90PCI PowerStation

- Intel™ 90MHz Pentium™ processor
- 256K write-back cache (up to 512K)
- 2X CD-ROM drive, 3.5" floppy drive
- 4 ISA, 2 PCI, 1 ISA/PCI, Flash BIOS
- PCI graphics accelerator (2MB)
- Desktop "Tool-Free" chassis
- MS Mouse, 101-key keyboard
- MS-DOS® & Windows® for Workgroups
- Microsoft® Office 4.2 CD*



- A**
- 8MB RAM (expandable to 192MB)
 - 420MB 14ms IDE hard drive (PCI)
 - 15" Micron 15FGx, 1280NI, .28mm, MPRII

\$2,599 (lease '94/month)

- B**
- 16MB RAM (expandable to 192MB)
 - 527MB 12ms IDE hard drive (PCI)
 - 15" Micron 15FGx, 1280NI, .28mm, MPRII

\$2,999 (lease '108/month)

- C**
- 32MB RAM (expandable to 192MB)
 - 1.0GB 10ms SCSI-2 hard drive (PCI)
 - 17" Micron 17FGx, 1280NI, .28mm, MPRII

\$4,299 (lease '147/month)

- D**
- 64MB RAM (expandable to 192MB)
 - 2.0GB 9ms SCSI-2 hard drive (PCI)
 - 17" Micron 17FGx, 1280NI, .28mm, MPRII

\$6,299 (lease '216/month)



June 1994
MAGNUM



May 1994
POWERSTATION



March 1994
MAGNUM



September 1993
MAGNUM



May 1994
POWERSTATION



*MS Office documentation on-line. Hard copy available for additional charge.

.....the..... User's Choice

They Keep Choosing Micron

Over and over, Micron is consistently ranked highest in overall customer satisfaction:

PC Magazine 1994 Readers' Choice Service &

Reliability Awards gave Micron the highest ratings in the categories of Overall Reliability, Satisfaction with Technical Support and Future Likelihood of Buying Again.



Quality Keeps Them Coming Back

As a leading manufacturer of memory chips and computer components for over fifteen years, Micron offers a superb combination of technical superiority and high reliability, backing its PCs with a knowledgeable, responsive technical support organization.

The Intelligent Choice

Smart buyers seek the highest performance for their dollar: "The 466VL came with everything we've come to expect in a high-performance machine," wrote *PC World*.

433 Magnum LP

- Intel™ 486SX 33MHz processor
- Pentium™ Technology Ready (ZIF)
- 4MB RAM (expandable to 48MB)
- 210MB 14ms IDE hard drive
- Local Bus Graphics (1MB)
- 14" Micron 14G, 1024i, .28mm
- Low profile chassis—NEW!
- 5 16-bit ISA slots
- MS-DOS & Windows for Workgroups
- Microsoft Mouse, 101-key keyboard
- Microsoft Works for Windows

\$1,199 (lease \$43/month)



- "Once in a while a company really hits all the hot buttons for PC buyers."
- "Micron Computer gets high performance from quality components and thoughtful design."
- "The Micron 466VL Magnum CD was easily the best Windows performer."

PC Magazine April 26, 1994

466PCI Magnum

- Intel 486DX2 66MHz processor
- Pentium Technology Ready (ZIF)
- 256K write-back cache, Flash BIOS
- 4 ISA, 2 PCI, 1 ISA/PCI
- 2X CD-ROM drive, 3.5" floppy drive
- Desktop "Tool-Free" chassis
- Microsoft Mouse, 101-key keyboard
- MS-DOS & Windows for Workgroups



466VL Magnum
Same low Price!

A

- 8MB RAM (exp. to 64MB)
- 420MB 14ms IDE HD (PCI)
- PCI graphics accelerator (1MB)
- 14" Micron 14G, 1024i, .28mm
- Microsoft Works Multimedia CD*

\$1,799 (lease \$55/month)

B

- 16MB RAM (exp. to 64MB)
- 527MB 12ms IDE HD (PCI)
- PCI graphics accelerator (1MB)
- 15" Micron 15FGx, 1280NI, .28mm, MPRII
- Microsoft Office 4.2 CD*

\$2,399 (lease \$87/month)

*MS Works and Office documentation on-line. Hard copy available for additional charge.



486 Family MPC

NEW!

- 2X CD-ROM drive, 3.5" floppy
- 16-bit Sound Blaster card, speakers & Kraft Thunderstick joystick
- 9600/2400 Fax/Modem & Winfax Lite
- Local bus graphics (1MB)
- 14" Micron 14G, 1024I, .28mm
- Low profile chassis
- Microsoft Mouse, 101-key keyboard
- MS-DOS & Windows for Workgroups
- MS Works Multimedia on CD*, Encarta 94 CD, Quicken CD Deluxe Edition
- Trial subscriptions for Compuserve, America OnLine & Prodigy
- 3 LucasArts CD games: Rebel Assault, Indiana Jones & Day of the Tentacle

A

- Intel 486SX 33MHz processor
- 4MB RAM (exp. to 48MB)
- 210MB 14ms IDE hard drive

\$1,399 (lease \$1/month)

B

- Intel 486DX2 66MHz processor
- 8MB RAM, 128K cache
- 420MB 14ms IDE hard drive

\$1,899 (lease \$69/month)

P90 Family MPC

- Intel Pentium 90MHz processor
- 8MB RAM, 256K write-back cache
- 420MB 14ms IDE hard drive (PCI)
- 2X CD-ROM drive, 3.5" floppy
- 16-bit Sound Blaster card, speakers & Kraft Thunderstick joystick
- 14.4/9600 Fax/Modem & Winfax Lite
- PCI graphics accelerator (2MB)
- 15" Micron 15FGx, 1280NI, .28mm, MPRII
- Desktop "Tool-Free" chassis
- Microsoft Mouse, 101-key keyboard
- MS-DOS & Windows for Workgroups
- MS Office 4.2 CD*, Encarta 94 CD, Quicken CD Deluxe Edition
- Trial subscriptions for Compuserve, America OnLine & Prodigy
- 3 LucasArts CD games: Rebel Assault, Indiana Jones & Day of the Tentacle

\$2,899 (lease \$105/month)

.....the..... Family's Choice

A Great Family To Choose From

Each Micron Family MPC system comes with a complete multimedia configuration including a 16-bit Sound Blaster card, speakers, CD-ROM drive and fax/modem, plus a selection of bundled CD software and trial on-line subscriptions for immediate enhanced home productivity and entertainment.



A Great Bundle For Less Than A Bundle

Micron's Family MPCs come with everything you need to enjoy the modern multimedia experience. *Encarta 94*, Microsoft's interactive multimedia encyclopedia, lets kids and adults learn more and have fun at the same time. Trial subscriptions for *Compuserve*, *America OnLine* and *Prodigy* put you on the way to exploring on-line information services. Microsoft *Works* and *Quicken Deluxe Edition* on CD, plus a built in fax modem, give you the latest office conveniences at home. You also receive the latest CD games from LucasArts, *Rebel Assault*, *Day of the Tentacle*, and *Indiana Jones and the Fate of Atlantis* let you relax with—or without—the kids.

MICRON
COMPUTER, INC.

Order Now
800-388-6334

*MS Works and Office documentation on-line. Hard copy available for additional charge.

.....the..... Choice is Yours!

MULTIMEDIA UPGRADE KIT



- SoundBlaster 16 sound card & speakers
 - Kraft Thunderstick Joystick
 - Microsoft Encarta 94 CD
 - Quicken CD-ROM deluxe edition
 - 3 LucasArts CD games: Rebel Assault, Indiana Jones & Day of the Tentacle
- \$200**
- Upgrade available with system purchase only.
Upgrade available within 30 days of system purchase only

- Next day shipping on selected systems
- 30-day risk-free money-back guarantee
- One-year express parts replacement
- Lifetime toll-free technical support
- On-site service available

MICRON

COMPUTER, INC.

Micron Computer, Inc.
900 E. Karcher Road Nampa, ID 83687
208-465-3434 FAX 208-465-3424
Purchase Order FAX 208-467-5384
Mon-Fri 7AM-8PM Sat 8AM-5PM (MST)

800-388-6334

© 1994 Micron Computer, Inc. All rights reserved. All prices and specifications subject to change without notice. Micron Computer, Inc. cannot be responsible for omissions and/or errors in typography or photography. Intel, Intel Inside, and Pentium are registered trademarks of the Intel Corporation. Microsoft is a registered trademark and Windows, Windows NT and the Windows logos are trademarks of Microsoft Corporation. All other company trademarks are trade names of each respective company. Prices do not include shipping and handling. 30-day money back guarantee does not include return freight and handling charges, applies only to Micron brand products, and begins from date of shipment. All returns require RMA numbers and must be shipped in the original condition prepaid and insured. Lease prices based on 36-month lease.

MORE PENTIUM

P66PCI PowerStation

- Intel 66MHz Pentium processor
- 256k write-back cache, Flash BIOS
- 4 ISA, 2PCI, 1 ISA/PCI slots
- 2X CD-ROM drive, 3.5" floppy drive
- PCI graphics accelerator (2MB)
- Desktop "Tool-Free" chassis, 3 fans
- Microsoft Mouse, 101-key keyboard
- MS-DOS & Windows for Workgroups
- Microsoft Office 4.2 CD*

A

- 8MB RAM (to 128MB)
- 420MB 14ms IDE hard drive (PCI)
- 15" Micron 15FGx

\$2,399
(lease \$87/month)

B

- 16MB RAM (to 128MB)
- 527MB 12ms IDE hard drive (PCI)
- 15" Micron 15FGx

\$2,799
(lease \$101/month)

C

- 32MB RAM (to 128MB)
- 1.0GB 10ms SCSI-2 hard drive (PCI)
- 17" Micron 17FGx

\$4,099
(lease \$141/month)

P66PCI PowerServer

- Intel 66MHz Pentium processor
- 512K write-back cache, Flash BIOS
- PCI 32-bit Fast SCSI-2 controller
- 5 EISA, 2PCI, 1 EISA/PCI slots
- 2X SCSI-2 CD-ROM drive
- 3.5" floppy drive
- PCI graphics accelerator (2MB)
- Tower: 10 drive bays, 3 cooling fans
- Microsoft Mouse, 101-key keyboard
- MS-DOS & Windows for Workgroups
- Microsoft Office 4.2 CD*

A

- 16MB RAM (to 192MB)
- 527MB 12ms SCSI-2 hard drive (PCI)
- 14" Micron 14G

\$3,399
(lease \$117/month)

B

- 32MB RAM (to 192MB)
- 1.0GB 10ms SCSI-2 hard drive (PCI)
- 15" Micron 15FGx

\$4,299
(lease \$147/month)

C

- 64MB RAM (to 192MB)
- 2.0GB 9ms SCSI-2 hard drive (PCI)
- 17" Micron 17FGx

\$6,599
(lease \$226/month)

*MS Office documentation on-line. Hard copy available for additional charge.

UPGRADES

Hard Drives

- 527MB 12ms IDE (from 420MB IDE) ... \$100
- 1.0GB 10ms SCSI-2 (from 527MB IDE) \$500
- 1.0GB 10ms SCSI-2 (from 527MB SCSI-2) \$300
- 2.0GB 9ms SCSI-2 (from 1.0GB SCSI-2) \$800
- 4.0GB 9ms SCSI-2 (from 2.0GB SCSI-2) \$1500

Tower Chassis (from desktop)\$100

All upgrades available with system purchase only.
Upgrades available within 30 days of system purchase only

Monitors

- Micron 15FGx (from 14G)\$150
- Micron 17FGx (from 15FGx)\$300
- NEC 21Multisync 6FGp (from 15FGx)
- 1280, .28, SVGA NI\$1700

Graphics Accelerators

- Diamond Stealth 64 2MB PCI ..call
- Matrox MGA-II 2MB PCIcall





Bill Howard

A Road Warrior's Wish List

If you lugged around a 28-pound, AC-only Compaq Portable with a 300-bps modem back in 1984, today's 5-pound notebooks may be dreams come true. But if you're like me—a laptop-toting, airplane-flying, hotel-sleeping road warrior—you're still

annoyed by the roadblocks remaining in an infrastructure ill prepared to accommodate today's mobile computer users.

After an especially annoying experience at a very posh Silicon Valley hotel, I compiled a wish list of amenities that would make life on the road more bearable. At one time in this hotel from hell, you couldn't dial out at faster than 1,200 bps, and picking up the handset on line one knocked your modem off line two. Recognizing the error of its ways, the hotel installed a third, 9,600-bps fax/modem line. But during my last visit there, no one could activate mine.

ROAD-WEARY WISHES

First on my wish list is that every hotel room, not just the \$300-a-night suites, have two-line phones with modem ports. This way, when rushing to get out for your first morning appointment, you wouldn't have to choose between downloading your e-mail and calling your family; you would be able to do both simultaneously. Line two would be a direct line to the outside, so you could receive incoming faxes or set up your notebook as a voice mail machine. And of course, the hotel wouldn't charge you for toll-free calls. Don't you hate it when you have to dial out ten times, at 75 cents a call, to make one good connection?

My next wish is for a hotel-room desk that could be adjusted from the standard 29-inch writing height to 26 inches for laptop use. I'd also like an adjacent AC outlet at desktop height, not floor height. And if any AC outlet near the desk is controlled by a wall switch, there would be warning decals on both to avoid the shock of finding out the next morning that your laptop was discharging, not recharging, all night.

Ideally, a hotel should provide a complimentary in-

room safe for your notebook (and other valuables) if you're not carrying it during the day. Do you know of anybody who uses the front-desk safes? Me neither. And since ink jet printers have become so inexpensive, hotels might provide them in business-oriented rooms. For all that, plus in-room fax machines (not every business traveler uses computers), hotels could justifiably charge an extra \$10 a night.

A handful of hotels claim they have special rooms for business travelers, but that often works out to be nothing more than a fax machine in your room and a copy of *USA Today* slipped under your door each morning for an extra \$15 a night.

AIRPORTS IN EDEN

In my road-warrior dream world, airports would have more public phones with modem jacks, and airline clubs would have AC outlets near each phone; you could use your computer, check e-mail, and recharge your batteries all at the same time.

Aloft, my perfect airplane would have either a 120-volt AC or a 12-volt DC outlet available in each row. (Boeing may do this on its 777s.) If that happened, I think we'd quickly see laptops capable of taking a direct 12-volt

feed without any external adapters or transformers. The FAA should also make the airlines rescind their silly "no laptops for the first and last 10 minutes of flight" rule. This is a perfect example of something that has little or no scientific underpinning yet sounds so reasonable ("We're all doing our part for safety; won't you help, too?") that you feel like an ogre for objecting.

Until some changes are made in the infrastructure, no new notebook technology will truly ease the pain of road-weary, laptop-carrying travelers. □



A number of infrastructure improvements are needed to help ease the pain of computing on the road.

Welcome to the virtual office.
It's as big as the earth.

At AMBRA™ we're making it possible for business people to work



anytime, anywhere.
At home, at 30,000 feet, or anywhere in between.

It means you have the flexibility to get work done on the run, to and from the office (the real one, that is).

It means you don't have to go in on the weekend.

It means, with fax and modem technology, you can always be in touch with your business.

And if you need it, you can always be in touch with 24-hour, toll-free IBM® technical support.

Of course, it's even better to avoid problems altogether. So every one of our notebooks is checked and rechecked. By our manufacturer. By XXCAL,® an independent compatibility lab. And finally, by our own exacting lab technicians.

That's why AMBRA notebooks are ideal for people on a fast track.

THE AMBRA ASSURANCE

- ▲ Toll-free IBM technical support, available 24 hours, 7 days a week.
- ▲ 30-day, airtight, money-back guarantee.
- ▲ One-year warranty on parts and labor.
- ▲ All portable systems are rigorously tested.
- ▲ XXCAL Gold Certification Program.



These are the fastest notebooks you'll find. Period. From AMBRA.

Powered by an incredible 100MHz (or 75MHz) DX4 processor, you'll zoom right along.

And with either a 10.3-inch dual-scan or a 9.5-inch active matrix screen, you'll see sharp, vivid color.

These notebooks sound better still when you consider the advanced audio features.



These notebooks pack a lot of power into a scant 6.7 pounds.

Record reminders. Or add sound clips to presentations.

With all this power, AMBRA notebooks are even more impressive when you consider that they check in at a lightweight 6.7 pounds.

To order, just give us a call now. Clearly, there's no better notebook.



Full-size keys mean fewer typos. And that should speed things up even more.

ACTIVE MATRIX WITH VISION

COMMON FEATURES

- ▲ Integrated Audio (Speaker and Microphone)
- ▲ Centered 16mm Trackball
- ▲ System Status Panel
- ▲ 4MB RAM, Max: 20MB
- ▲ 3.5" 1.44MB Diskette Drive
- ▲ Type III PCMCIA Slot (1 Type III/2 Type II)
- ▲ 85-Key Keyboard
- ▲ MS-DOS® 6.2
- ▲ Windows™ for Workgroups® 3.11
- ▲ 6.7 Pounds, Including NiMH Battery
- ▲ Includes AC Adapter and Slip Case

N100T-450 **\$3699**

Business Lease: \$131/Month

- ▲ 100MHz Intel® DX4
- ▲ 450MB Hard Disk Drive, Upgradable
- ▲ 9.5" Active Matrix TFT Color Display with Local Bus Video and 1MB Video RAM

N75T-340 **\$3499**

Business Lease: \$124/Month

- ▲ 75MHz Intel DX4
- ▲ 340MB Hard Disk Drive, Upgradable
- ▲ 9.5" Active Matrix TFT Color Display with Local Bus Video and 1MB Video RAM



ORDER NOW



©1994 AMBRA Computer Corporation. The AMBRA logo and logotype are trademarks of AMBRA Computer Corporation. AMBRA is a trademark of ICPI Ltd. and used under license therefrom. The Intel Inside Logo is a registered trademark of Intel Corporation. All other brands and product names are registered trademarks, trademarks or service marks of their

State-of-the-art active matrix color screen is available for the 75MHz and 100MHz models.

The easy-to-use 16mm trackball is centered below the space bar.

There's a large palm rest for comfortable data entry.

A 10.3-inch dual scan is available with the 75MHz model.



Use the internal speaker or connect optional external speakers to make a big impact with multimedia presentations.

Keep your battery charged while keeping your place with our suspend/resume.

100MHz. COMES POWER.

N75D-340 \$2599
Business Lease: \$92/Month

- ▲ 75MHz Intel DX4
- ▲ 340MB Hard Disk Drive, Upgradable
- ▲ 10.3" Dual-Scan DSTN Color Display with Local Bus Video and 1MB Video RAM



N75D-340
InfoWorld,
May 23, 1994

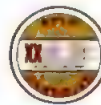


N75D-340
PC World,
August 1994
issue

N100/75 Options

- ▲ 4MB Memory
- ▲ 8MB Memory
- ▲ 16MB Memory
- ▲ NiMH Battery
- ▲ Battery Charger
- ▲ 2.4/9.6 PCMCIA Data/Fax Modem
- ▲ 14.4 PCMCIA Data/Fax Modem
- ▲ 12Volt DC Auto Adapter
- ▲ AC Adapter
- ▲ Docking Station
- ▲ Deluxe Attache Carrying Case
- ▲ Extended Warranty

Use the microphone to record voice reminders. Or record audio clips through the inline jack.



1 800-200-3186



respective holders. Offerings may differ in Canada. Prices do not include shipping. Return shipping and insurance charges are the responsibility of the customer. Please call for details regarding AMBRA'S money-back guarantee, limited warranty and extended warranty. Lease based on 16 months, offered by IBM Credit Corp. Offerings, prices and products are subject to change without prior notice.

Pop Your Users Into Just This Easily, And For



Our Personal Server Not Much More Bread.

Remove wrapper. Plug in. Serves a bunch.

It's nearly that easy with Z-STOR™, the new workgroup server from Zenith Data Systems that thinks it's an appliance. And like an appliance, the Z-STOR can be set up in minutes, allowing you to quickly connect desktop and notebook computers to a small workgroup, or remote users to a central office.

When industry leaders coined the term "Plug and Play," they had products like Z-STOR in mind. Z-STOR is so easy to operate, switching the power on and off is all you need to worry about. And it automatically reconfigures itself at start-up whenever you add users or change drives. Plus, with Personal NetWare™ pre-loaded, the Z-STOR integrates seamlessly into the corporate NetWare® environment.

Expanding Z-STOR is easy as well. Its PCMCIA slot accommodates a high-speed modem for remote access, a Token Ring adapter or system recovery

card. And snap-in expansion bays can house a CD-ROM drive, tape back-up, or other mass storage devices, providing up to five gigabytes of internal storage.

We should also mention the parallel port that enables fast print sharing. Built-in Ethernet, which provides affordable

LAN connectivity. The almost silent fan. And our Energy Star-compliant* power supply that draws less than 30 watts.

All this is packed into a chassis that's not much larger than a toaster. Meaning the Z-STOR fits under your desk, on the bookshelf, in the wiring closet, just about anywhere. Another example of how ZDS™ makes connecting computers, and people, easier than ever.

Oh, one more point. At just \$999,** Z-STOR is easy to own. So call us, and find out why the Z-STOR personal server is the best thing since sliced, well, you know.

1-800-945-0673, Ext. 5112



ZENITH
DATA SYSTEMS 

MAKE THE CONNECTION™

Copyright © 1994 Zenith Data Systems Corporation. Zenith Data Systems Corporation is a Bull company. Z-STOR, ZDS and Make The Connection™ are trademarks of Zenith Data Systems Corporation. NetWare is a registered trademark, and Personal NetWare is a trademark of Novell. The Energy Star logo is trademark of the Environmental Protection Agency. *Installing a CD-ROM drive nullifies Energy Star compliance. The EPA, as a matter of policy, does not endorse companies or products. **Z Direct price. Prices and specifications subject to change. Resellers determine their own prices which may be higher or lower than the Z-Direct price.

90-MHz PENTIUM PCs

Pentium POWERHO

By Jim Seymour

Finally: Start the revolution. From the day Intel announced its Pentium processors, they were heralded as a revolutionary step forward in PC power. Unfortunately, the first 60- and 66-MHz Pentium systems delivered last summer didn't quite live up to the hype. True, they were noticeably faster than the 486DX2/66 units that had become the high-performance standard. But as older, 0.8-micron designs running at 5 volts, they ran hot—very hot, as some unlucky buyers and PC makers discovered. In retrospect, it seems the 60- and 66-MHz Pentiums were far more evolutionary than revolutionary, serving more as placeholders for the next round of chips—the “real” Pentiums, according to insiders.

Now that the second-generation Pentium P54C chips are shipping in volume, we can see what the initial Pen-

tium hoopla was all about. The new 90- and 100-MHz Pentiums, and the PCs built around them, really do offer revolutionary improvements. And because they're fabricated on a newer 3.3-volt process, your upgrade options are likely to be far greater than they were with dead-end 5-volt technology. At last, you can buy a Pentium PC and be confident that it will lead a long and useful life on your desktop. (P.S.: It doesn't hurt that these systems are remarkably cheap, too.)

REVIEW CRITERIA

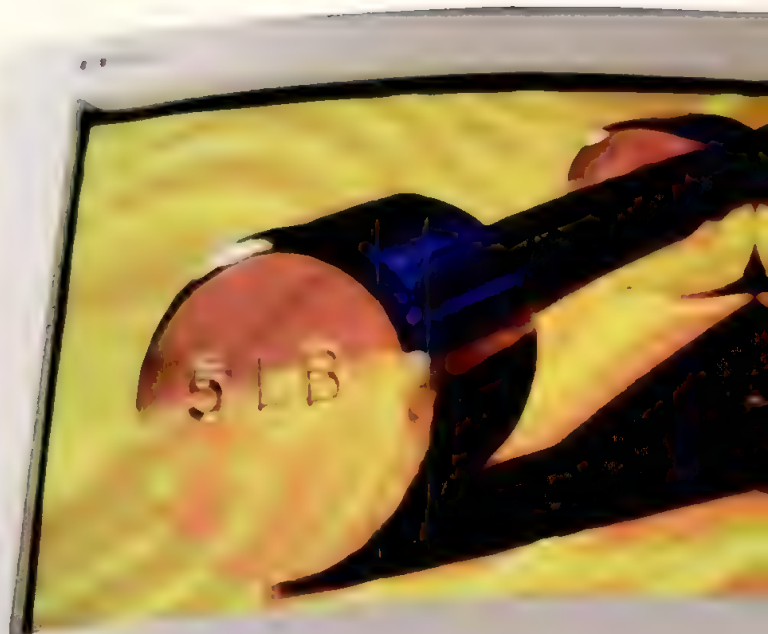
When we set out to review systems based on the new Pentium, our requirements were simple enough: We sought to test every 90-MHz Pentium PC now shipping, configured with a minimum of 16MB of RAM, a 300MB hard disk, a 15-inch SVGA monitor and graphics card, a CD-ROM drive, a keyboard, a mouse, DOS 6.2 or later,

► IN THIS REVIEW

Aberdeen Super P90 VLPCI.....118	Hewlett Rand HR P5-90 Panther...158	Tower.....177
ACMA P90 PCI.....121	HP Vectra XU 5/90C.....160	Tagram Thunderbolt P90.....177
AMAX 90MHz PowerStation.....121	Initiative Technology ITI 590 Pi...160	Tagram Thunderbolt PCI 90.....177
Ambra TP90PCI.....128	Insight PCI P90 SCSI.....162	Tangent PCI-590.....187
ARES Pentium Pro 90.....136	Mega Impact P90PCI/VLB+.....165	Tri-CAD Vigor Pentium-90.....187
AST Premmia GX P/90	Memorex Telex Celerria LP90.....165	Xinetron Green Pentium
Model 733C.....136	MicroFLEX-VL/Pentium/90.....165	90MHz.....187
AT&T Globalyst 600.....136	Micron P90PCI PowerStation.....166	Zenon Z-Titan Pentium 90MHz..188
Axik Ace Power 586-90PCI.....143	Mitsuba Premier System-90.....171	ZEOS Pantera 90.....189
CAF Lightning P9.....143	NETiS N590 Pentium System.....171	Highlights.....114
Comtrade Professional P5/90.....147	Novacor Nova Pentium 90.....172	Editors' Choice.....115
Dell Dimension XPS P90.....147	Pactron Quake 9NSX90.....175	Price/Performance Index.....120
Diamond DT 586-90.....153	Polywell Poly 586-90VLB.....175	The Future of the x86
EPS P90 Explorer.....154	Royal Media Master IV.....175	Architecture.....124
FCS Green Pentium 90.....155	Sidus SCI9P590PDT.....176	Performance Tests.....128
FutureTech System 5490P.....155	Solmicro Arena PVi90.....177	Multiply Your Investment.....144
Gateway 2000 P5-90.....155	Sys Performance Pentium 90 Full	Summary of Features.....153

USES

The 90-MHz Pentium processor readily outpaces its 60- and 66-MHz predecessors. PC Magazine Labs tests 40 desktop systems based on the second generation of Intel's highest-performance processor family.



Ultra VGA 1280



HIGHLIGHTS

90-MHz Pentium PCs

LOOKING FOR SPEED? These 40 Pentium/90 systems are on the average nearly 40 percent faster than Pentium/60 and Pentium/66 machines; they are also more than twice as fast as 486DX2/66 systems. But don't assume that a 90-MHz Pentium CPU guarantees top-tier performance: Some poorly tuned systems are actually slower than well-designed Pentium/60 machines.

THE 90-MHz PENTIUM runs on 3.3 volts, keeping it cool and moderating its power consumption. As a result, you'll begin to see Energy Star-compliant Pentium systems and perhaps even Pentium-based portables this fall. Around the same time, you can expect

100-MHz Pentium systems to begin shipping in quantity. Right now, 100-MHz CPUs are still a rarity.

COMPONENTS AND INTEGRATION can dramatically influence performance. Machines based on Intel's Neptune chip set outpaced similarly equipped systems using OPTi's Python chip set. The Diamond Stealth Pro 64 graphics board turned in the best Windows graphics performance.

ENHANCED IDE HARD DISK subsystems trounced SCSI-based subsystems on our tests. Unless you've got a compelling reason to choose SCSI, Enhanced IDE provides all the performance and expandability you're likely to need.

PRICES FOR PENTIUM/90 SYSTEMS

are remarkably low. The tested machines average under \$4,000, and some are below \$2,900. Mainstream PC prices are dropping as a result. By late this year, you can expect to see multimedia-equipped Pentium/60 machines for less than \$2,000.

WELCOME EXTRAS on some systems include integrated Ethernet support (in the AST Premia GX P/90 Model 733C and the HP Vectra XU 5/90C) and PCMCIA slots (on the ACMA P90 PCI and the AMAX 90MHz PowerStation). The Tri-CAD Vigor Pentium-90 has removable hard disks that can be mirrored, providing both redundancy and physical security.

and Microsoft Windows 3.1 or later. Several vendors submitted units that exceeded these minimum requirements, with as much as 32MB of memory, 2GB of disk storage, and up to 17-inch monitors.

We didn't look at 100-MHz Pentium PCs for one reason: We couldn't find any. At press time, 100-MHz parts were being produced in such minimal quantities that we couldn't find a PC vendor using them.

The shortage of 100-MHz CPUs has to do with Intel's production yields. Just as with the 60- and 66-MHz Pentiums, the 90- and 100-MHz chips are actually the same product, coming off the same production line on the same silicon wafers. During the quality-control process, Intel determines whether chips can run reliably at 100 MHz or only 90 MHz, stamps the ceramic chip package with the appropriate speed rating, and then sells them.

We expect the floodgates will open for 100-MHz parts in October or November. Unless you're on a vendor's "special accounts" list, you're most likely not going to get your hands on a 100-MHz machine until then.

Two vendors did send us 100-MHz PCs: Micron Computer and Polywell Computers. In both cases, examination of the CPUs and blind calls to the vendors' sales departments led us to the conclusion

that neither system was a shipping product. With Micron's assistance, we reset its machine to run at 90 MHz, as does its currently shipping system. And since Polywell had shipped us both 90- and 100-MHz machines, we simply dropped its 100-MHz system from the group. We did perform tests on the prototype 100-MHz systems to get a sense of their capabilities. As expected, their CPU performance was about 10 percent faster than that of their 90-MHz siblings; overall performance showed a similar increase.

We also received a machine from Personal Computer Graphics Corp. that was running at a nonstandard 108-MHz clock speed. We declined to review this product, partly because we don't recommend running processors at higher than their rated speeds (it makes them more likely to fail and, in any case, voids their warranty) and partly because we doubt that such a configuration would actually be

shipped to users. Our decision was supported when the Personal Computer system failed after a day of intense testing—this despite a humongous heat-sink-and-fan combination strapped to the CPU. You'll note that some major vendors are not represented in this roundup—most

notably Compaq and IBM, whose Pentium/90 systems have been delayed while the companies design their own motherboards and chip sets.

A NEW STANDARD

So how much faster are these new 90-MHz Pentium units than their 60- and 66-MHz predecessors? Nearly 40 percent. And they're more than twice as

fast as DX2/66 systems. That's a dazzling improvement; no user is going to overlook this performance difference.

As impressive as the speed gains of these 90-MHz machines are, the modest cost of that increase may be even more surprising. A fully configured 90-MHz

RECENT REVIEWS

► **Notebooks: The Spectrum of Choice**

August 1994page 112
We test 70 of the newest notebook PCs.

► **Picking the Perfect PC**

July 1994page 113
We help you put together your perfect PC.

► **Tomorrow's PC**

May 31, 1994page 112
We look at the first Pentium/90 and DX4 systems to hit the market.

system is about half the cost of a comparable 60-MHz system just a year ago.

Part of the reason for this precipitous drop in price is the competition threatening Intel's market share. (See the sidebar "The Future of the x86 Architecture" for more information.) As a result of this competition, Intel is pushing the market toward Pentium-level processors as fast as possible and ceding low-margin 486 territory to companies like Advanced Micro Devices and Cyrix Corp. To accelerate this changeover, Intel has dropped Pentium chip prices about three times as fast as it did with its earlier microprocessor designs. The price of a 60-MHz Pentium processor is now only \$418, which means you can expect to see multimedia-equipped Pentium PCs for under \$2,000 this holiday season.

Another reason for the sharp drop in Pentium PC prices is the explosion of the home-PC market. The home-PC buyer has traditionally supped at the table of the corporate buyer, waiting for power to become affordable. But now the tables have turned, and while business buyers are content with DX2-based systems for their companies' power users, home-PC buyers are flocking to Pentium in search of more processing power to meet the demands of increasingly popular multimedia game and educational software.

THE HEAT'S OFF

More than a few PC buyers have stayed away from Pentium-class machines because of concerns over heat buildup. With the early 60-MHz machines, this was smart. A hot CPU can not only burn itself out; it can also damage other nearby components or, in extreme cases, burn out the motherboard itself. PC-generated fires are rare, but expensive repairs growing out of poor heat dissipation are not.

In designing the first 60- and 66-MHz Pentium systems to hit the market, PC makers relied on a combination of multiple

internal fans and variations on the theme of chip-mounted heat sinks to draw off the chips' extraordinary heat. Some approaches worked well; others worked, but only barely. Good mechanical design has long been rare in PCs; companies trying to shave 5 dollars off a new machine's cost

hire few engineers experienced in thermal management techniques.

With these new Pentiums, the heat problem has largely been eliminated. When Intel shrunk the chips from its 0.8-micron process to a 0.6-micron process, it also reduced the supply voltage from 5 volts to 3.3. This combination dramatically reduced heat output. Good system design is still important, but the painful experiences of many PC makers with their early 60- and 66-MHz designs have apparently helped: Many of the machines tested here showed more sophisticated thermal engineering than we've seen before.



Features choices:

- **HP Vectra XU 5/90C**
- **Tri-CAD Vigor Pentium-90**

Value choice:

- **Sys Performance Pentium 90 Full Tower**

While plenty of the machines we tested excelled in one way or another, two earn Editors' Choice awards for uniting superior design with top-flight performance:

the HP Vectra XU 5/90C and the Tri-CAD Vigor Pentium 90. The HP Vectra, now \$5,845, is a returning Editors' Choice winner from our June 28, 1994, issue. It offers great performance and comes with extras you will love, such as a 17-inch monitor, built-in Ethernet support, an easy-to-disassemble design that makes maintenance simple, and a three-year parts-and-labor warranty with the first year of on-site service included.

The Tri-CAD Vigor Pentium-90 was a top performer on our Winstone and Graphics WinMark tests, placing third on both. The unit includes two 527MB removable hard disks, which can be pulled out and locked away for better data security. The Tri-CAD Vigor's 8MB caching disk controller lets you mirror the two disks to provide redundancy as well. The unit comes with a 17-inch monitor and sells for \$4,895.

The Sys Performance Pentium 90 Full Tower demonstrates that you don't have to pay stratospheric prices

to get top-of-the-line features and performance. This system edged out the HP Vectra and Tri-CAD Vigor for the top score on our Winstone tests. Yet it sells for a remarkably low \$3,490 even with a 1GB hard disk—a price/performance ratio that's tough to beat.

OTHER CONTENDERS

The Zenon Z-Titan Pentium 90MHz earns an honorable mention for its outstanding performance and extraordinarily low price of \$2,845. It's not quite as well outfitted as the Sys Performance Pentium, but it's also more than \$500 less expensive.

The \$3,195 ZEOS Pantera 90 excels in the price/performance arena, but it doesn't earn an honorable mention because its motherboard design severely limits its expandability. The Micron P90PCI PowerStation, a previous Editors' Choice winner, is still a good value at \$3,999 but no longer holds the leadership position it enjoyed in the past.

Our Contributors: JIM SEYMOUR is a contributing editor of *PC Magazine*. NICK STAM is technical director (hardware) at PC Magazine Labs. ROBERT S. ANTHONY is a senior writer and WILLIAM P. FLANAGAN is a staff writer at *PC Magazine*. CAROL A. VENEZIA and ANUSH YEGYAZARIAN are staff editors at *PC Magazine*. DANIEL A. BEGUN is a technical analyst at PC Magazine Labs. MARY E. BEHR and JODI L. WYNBLATT are editorial researchers. JOHN CLYMAN was the associate editor in charge of this story, and RICHARD FISCO was the project leader.

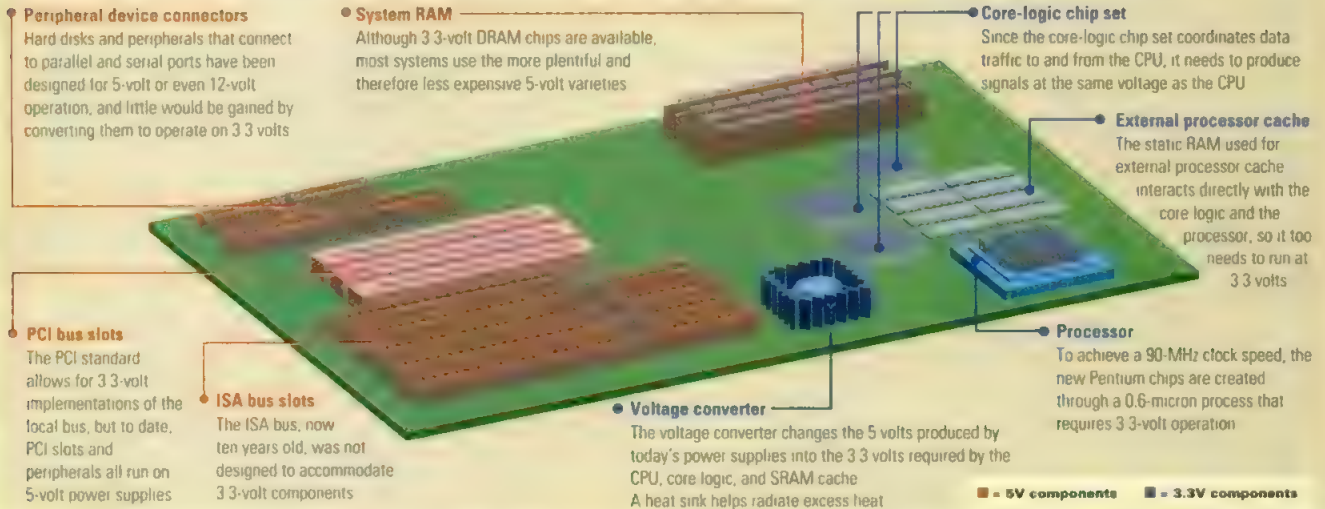
How a 3-Volt CPU Fits In

Although the 90-MHz Pentium CPU outperforms its 60- and 66-MHz predecessors, it also draws less power and runs cooler. That's because the new Pentium operates internally on 3.3 volts rather than the traditional 5 volts. In fact, the future for 5-volt processors is limited; to maximize performance, processor manufacturers must continually shrink their CPUs, which requires a transition to lower-voltage components.

While you can expect that future x86 processors will run on 3.3 volts, for the next few years most systems will employ a hybrid of 3.3- and 5-

volt logic as depicted here. The components that interact closely with the CPU—the core-logic chip set and the L2 processor cache—generally run at 3.3 volts. Other components continue to use 5-volt supplies, because 5-volt chips are less expensive.

The power supplies in most systems today can't produce 3.3 volts. Hence, system manufacturers resort to ungainly voltage converters, which also require large heat sinks to radiate heat. By year's end, you can expect to see power supplies capable of producing 3.3 volts.



WHAT TO LOOK FOR

If you want to make the most of a Pentium/90 system, here are some factors to consider before you buy:

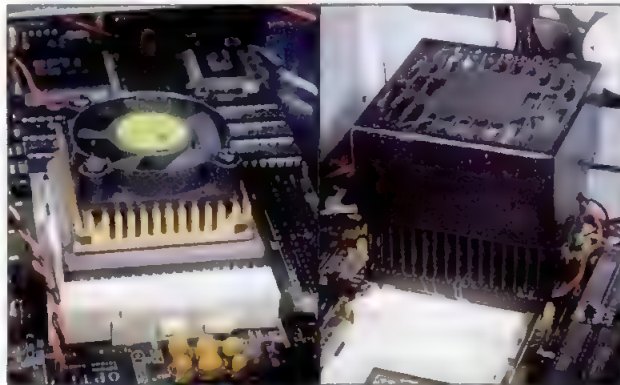
- Make sure the system uses 16550C UARTs (Universal Asynchronous Receiver/Transmitters) to drive its serial ports. As V.34 and subsequent standards for fast communications become entrenched, state-of-the-art UARTs are going to be even more important.
- Watch out for vendors who squeak in under some perceived magic price point by cutting corners. A couple of units here came in under \$3,000—but only by skimping on hard disk capacity (providing 300MB instead of 500MB or more) or providing less than the realistic minimum of 2MB of RAM on video cards.
- Two machines tested, the AST Premia GX P/90 Model 733C and the HP Vectra XU 5/90C, had integrated Ethernet support. Built-in Ethernet has two advantages: It's convenient, and it's basically free. Look for it to become common as more machines in this class come to market.

• HP also gets points in our book for system design. The front-panel push-button/LED block rotates, so it reads correctly whether the unit is tipped on its side or positioned beneath the monitor. The HP Vectra has a

troller that can be used to mirror them. Even better, the drives are removable for physical security—a Tri-Star trademark.

• AMAX Engineering Corp. thinks a PCMCIA “drive” (which is more of a slot, actually) offers a great way to interchange data with your notebook. The company's system includes a PCMCIA drive that accepts either two Type II cards or one Type III card. We can't think of much you'd want to add to a desktop PC that can be added only via PCMCIA (and you can add a similar dual-slot drive to any desktop PC for about \$200), but for two-PC users, this is a nice feature.

• Although systems with both PCI and VL-Bus connectors might be appealing, you'll pay the price when it comes to performance. All of the machines here with two high-speed buses used an OPTi



Left: An unobtrusive heat sink like this one is usually adequate for the cool-running Pentium/90. **Right:** Despite this hulking heat sink cum fan, the Personal Computer Graphics Corp. system—overclocked at 100 MHz—burned out during testing.

quick-disconnect construction reminiscent of what we saw with the no-tools-needed design of the early IBM PS/2s.

• Tri-Star Computer showed intelligent design in its Tri-CAD Vigor Pentium-90, including two 527MB drives and a con-

chip set and gave up 10 percent or more in overall performance.

• If you're a serious power user looking for upgradability, three of the tested machines provide Intel's Socket5 for a second Pentium CPU. The AST Premia, the HP

THE 170MB COMPAQ CONTURA AERO AT \$1,199.



Take Two, They're Small.

CONTURA AERO FEATURES

ONLY 3.5 LBS.
486SX/25 PROCESSOR
4MB RAM
(EXPANDABLE TO 12MB)
170MB HARD DRIVE
PCMCIA Type II SLOT
8 MONOCHROME
BACKLIT VGA DISPLAY
INTEGRATED COMPAQ
EASYPOINT™ TRACKBALL
NIMH BATTERY PACK
AND AC ADAPTER
WINLINK FILE TRANSFER
UTILITY WITH CABLE
PREINSTALLED MS-DOS®
MS WINDOWS™, TABWORKS®
LOTUS ORGANIZER
1 YEAR PICK UP
WARRANTY*
COSTLY UNITS AVAILABLE
CALL FOR INFORMATION

The Compaq Contura® Aero™ is everything a great 486 subnotebook should



be. First of all, it's quite small. Only 7.5" wide, 10.25" high, and 1.5" deep. And you'll find it's also very light, a mere 3.5 lbs.

But most importantly, the Contura Aero is an incredibly full-featured and useful working tool. It comes with 4MB RAM, an 8" monochrome back-

lit VGA display, integrated trackball, preinstalled software and more.

For added flexibility, consider the Contura Aero Option Pack™. You'll get an additional battery pack, an external floppy disk drive, a PCMCIA data+fax modem, and a carrying case or backpack.

At last. A quality subnotebook with a price proportional to its size.

CONTURA AERO UPGRADES & OPTIONS	
ADDITIONAL 4MB RAM (8MB TOTAL)	ADD \$245
CONVENIENCE BAG	ADD \$99
3.5" EXTERNAL FLOPPY DISK DRIVE	ADD \$99
CANON BJ 100A BUBBLE JET PRINTER	ADD \$269

COMPAQ
DirectPlus



ASK FOR OUR NEW
FREE CATALOG

1-800-888-6052

WEEKDAYS 7-7, SAT. 10-4 CST



*Price good only with purchase of Contura Aero purchased through Compaq DirectPlus. Restrictions and exclusions apply. Compaq Aero is covered by a three-year pick up warranty. Monitor, battery packs and certain options are covered by a one-year warranty. © 1994 Compaq Computer Corporation. All rights reserved. Compaq and the Compaq logo are registered U.S. Patent and trademark of Compaq Computer Corporation. DirectPlus is a registered service mark of Compaq Computer Corporation. Aero is a trademark and Option Pack is a service mark of Compaq Computer Corporation. Products, prices and programs are subject to change without notice. Other products are trademarks or registered trademarks of their respective companies. Microsoft and MS-DOS are registered trademarks and Windows is a trademark of Microsoft Corporation. TabWorks is a registered trademark of Xerox Corporation. The Intel logo is a registered trademark of Intel Corporation. Offer as available in the U.S. only.

Vectra, and the Royal Media Master IV all let you upgrade to a dual-processor system by adding Intel's P54CM CPU. Keep in mind that to make use of this feature you'll need an operating system that supports dual processors. (See the sidebar "Multiply Your Investment" for details.)

WHICH HARD DISK?

Traditionally, it's been SCSI and not IDE hard disks that were associated with top-performing systems. IDE was deemed suitable only for low-end PCs because of its limited device support and 528MB capacity constraint. But Western Digital Corp. changed the rules with its Enhanced IDE specification, which improves transfer speed, overcomes the former IDE-drive size limitation, increases the number of devices to four per Enhanced IDE interface, and allows connections of CD-ROMs and other peripherals. More than half of the machines we tested used IDE hard disks, and virtually all of these outperformed their SCSI-based counterparts.

The predominant hard disk capacity among the tested units was 500MB, but you may definitely want to consider a 1GB disk for machines of this caliber. That second half a gigabyte will add only about \$300 to the cost of your system. And now that

Enhanced IDE drives larger than 500MB are available, a gigabyte of storage doesn't necessarily commit you to the additional expense and configuration hassle of SCSI.

SIGN UP HERE?

If you're just not ready for a Pentium/90 system, what are your alternatives? Your best bet is probably a Pentium/60 or Pentium/66 machine. Already, we've begun to see PCs based on the older Pentiums selling for under \$2,000. These aren't necessarily stripped boxes, either; many are relatively fully configured.

What about clock-tripled DX4s? The workhorse DX2/66s? And all those flavors of SX chips? With Pentium-based PCs selling for so little, it's hard to recommend other x86-family chips for desktop PCs—except in extremely cost-sensitive environments where DX2s and DX4s may make sense. Pentium-class processors from AMD, Cyrix, and NexGen remain wildcards; we don't know yet how well these new CPUs will perform, although they're sure to be competitively priced.

On the pages that follow, you'll find profiles of 40 Pentium/90-based PCs. Read them closely: If you're not in the market today, there's a good chance you will be... perhaps sooner than you think.

resource demands of Windows today, bigger is always better.

Those systems with *excellent* ratings in this category posted stellar processor scores and contained top-flight video controllers and fast hard disks, as evidenced by their excellent Graphics WinMark and Disk WinMark scores.

The **DOS applications** score reflects a system's ability to run DOS software quickly and efficiently. *Excellent* systems are those that earned top DOSmark scores on our benchmark tests and can run TSRs and memory-intensive DOS applications.

Expandability refers to a system's growth potential. Considerations include ease of processor and external cache upgrades, system BIOS, hard disk options, maximum RAM installable on the motherboard and via expansion cards, available drive bays and bus slots, the presence of a flash-upgradable BIOS system, and the presence of a 16550 UART

Aberdeen Inc.

● Aberdeen Super P90 VLPCI

Priced competitively at \$3,295, the Aberdeen Super P90 VLPCI produced consistently average scores on our benchmark tests. This system offers users the flexibility to add either PCI- or VL-Bus-based expansion cards. Aberdeen also backs the unit with an exceptional warranty.

The Aberdeen Super P90 uses the same Super Micro motherboard (based on OPTi's Python chip set) as the EPS and Mega entries. Its motherboard features three ISA, two VL-Bus, and four PCI expansion slots (one ISA and one PCI slot share a backplate, so only one of the two is usable at a time). One ISA slot is blocked by the I/O interface, however. The case offers only five drive bays—fewer than what the average mini-tower system provides. Aberdeen chose to use a VL-Bus-based disk controller and a PCI-based ATI Graphics ProTurbo 64 video card, which utilizes the ATI Mach 64 video chip set.

The Aberdeen Super P90 practically set the average for this test group. The system's Disk WinMark and Graphics WinMark scores were middle-of-the-

high-speed serial-port chip. The best systems have drive bays and slots to spare and easily upgradable processor/cache subsystems.

SERVICE AND RELIABILITY

In our 1994 Service and Reliability Survey, we sent questionnaires to 17,000 subscribers; about half replied. Vendors for which we received at least 50 responses are rated *above average*, *average*, or *below average* in three areas:

SUITABILITY TO TASK	
Windows applications	EXCELLENT
DOS applications	GOOD
Expandability	FAIR
VENDOR SERVICE & RELIABILITY	
Reliability	ABOVE AVERAGE
Repair service	AVERAGE
Technical support	BELOW AVERAGE

Reliability scores indicate to what degree PC owners felt their systems met their overall expectations for consistent operations.

Repair service scores are culled from users who contacted the vendors to have their PCs repaired.

Technical support scores measure how well vendors' telephone support met respondents' expectations.

Suitability to Task:

90-MHz Pentium PCs

No one buys a 90-MHz Pentium PC just to run DOS applications. While our Suitability to Task ratings take a spectrum of hardware and support aspects into consideration, what matters most for many buyers is Windows performance—in which the current crop of PCs excels.

The **Windows applications** rating indicates how well a system will operate Windows software. This score takes into account system hardware and benchmark test results, including Graphics WinMark and Disk WinMark test scores and the score each system earned on Winstone 94, Version 1.0.

We also give weight to hardware specifications. For instance, the maximum RAM a system allows (either on the motherboard or through a proprietary add-in card) is important not only for traditional Windows use but especially for Windows NT. Likewise, we take into account a system's hard disk options and the diagonal size of its monitor; given the intense

Tagram's Thunderbolt PCI-90 Scored 112 on Winstone 94, No Kidding!

It beats everybody! Yes, Tagram's Thunderbolt PCI-90 combines the latest technologies of PCI & VL-Bus, with a 64 bit graphics card and 2MB RAM, "Mode 3" Enhanced IDE Controller and UART 16550 Super Fast Serial & ECP/EPP Enhanced Parallel Port.

\$3119

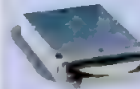


Source—PC Magazine June 28, Page 175

Free TEAC 4X CD!

For the First 500 Thunderbolt PCI-90 buyers only!

Call now and take the big leap! Mention this ad and we will give you a free upgrade from a double speed CD ROM Drive.



Tagram, Your Only Choice! The Editors' Choice!



"In terms of performance, the Tagram Thunderbolt lived up to its name and then some"—PC Magazine Jun 28th, Page 115

Tagram offers Solid Service and Warranty to Back you up

Now, every Tagram system is shipped with a 3 year parts & labor extended warranty.

Tagram's Technical Team always stands by its customers and that's why PC World Magazine awarded Tagram's Technical Team with the Best Service & Support.

Take the Ultimate Spin with Tagram's Quad Speed CD

600KB/Sec. DTR, 195ms DAT, Tagram now brings you the next

generation in CD Computing with the TEAC Super Quad CD ROM drive. It delivers fluid motion video, and eliminates jerky images on your screen. It simply blows away double speed and triple speed CD ROM drives.



TEAC.

Free Jurassic Park Multimedia Screen Saver CD

Protect your monitor screen while reliving all the drama of the movie with actual video footage, graphics, and sound.



HUNDERBOLT

- ◆ Intel OverDrive Ready VLB Motherboard
- ◆ 8MB RAM w/256K Write Back Cache
- ◆ 420MB IDE Drive w/256K Cache
- ◆ 2X CD ROM Drive/1.44MB Floppy Drive
- ◆ 1 MB Flash BIOS/PCI Upgradable
- ◆ 32-Bit W32P VL-Bus Graphics w/1 MB
- ◆ 32-Bit "Mode 3" Enhanced IDE Interface
- ◆ UART 16550 Fast Serial Ports
- ◆ ECP/EPP Enhanced Parallel Port
- ◆ Optique 2000 DS 15" NI Green Monitor
- ◆ MS DOS & Windows For WorkGroups
- ◆ Jurassic Park Multimedia Screen Saver

Intel® 486™ DX2-66 **\$1899**

with 16MB RAM, 540MB, 2MB Video

Intel® 486™ DX4-100 **\$2599**

Intel® 486™ DX2-66 **\$2299**

HUNDERBOLT

- ◆ Intel Pentium PCI/VLB Motherboard
- ◆ 16MB RAM w/128K Write Back Cache
- ◆ 540MB IDE Drive w/256K Cache
- ◆ 2X CD ROM Drive/1.44MB Floppy Drive
- ◆ W32P PCI Graphics w/2 MB
- ◆ 32-Bit "Mode 3" Enhanced IDE Interface
- ◆ UART 16550 Fast Serial Ports
- ◆ ECP/EPP Enhanced Parallel Port
- ◆ Optique 2000 DS 15" NI Green Monitor
- ◆ MS DOS & Windows For WorkGroups
- ◆ Jurassic Park Multimedia Screen Saver

Intel® Pentium™ 90 **\$3119**

Intel® Pentium™ 60 **\$2819**

Thunderbolt VLB 90 **\$2999**

1GB Enhanced IDE HD add \$350

Call for More Upgrade Options

800-824-7267



TAGRAM

System Corporation

"Ask what we can do for you"

Free Access to 24 Hour BBS • 3 Years P & L Warranty • 30 Day Money Back Guarantee • Toll Free Technical Support • GSA Contract #: GS00K94AGS

1451 Edinger Ave. Suite B, Tustin, Ca 92680 • Tel: 714-258-3222 Fax: 714-258-3220 • BBS: 714-258-7110 • Mon. - Fri.: 9am - 5pm Sat.: 9am - 4pm (P.S.T.)

The Intel Inside Logo is a registered trademark of Intel Corporation. All trademarks and tradenames herein are properties of their respective owners. Price, specification and terms are subject to change without notice. 30-day money back guarantee does not include shipping and handling charge. opened software and special orders. PO's, APO and FPO orders are accepted.

CIRCLE 008 ON READER SERVICE CARD

■ Price/Performance Index: 90-MHz Pentiums

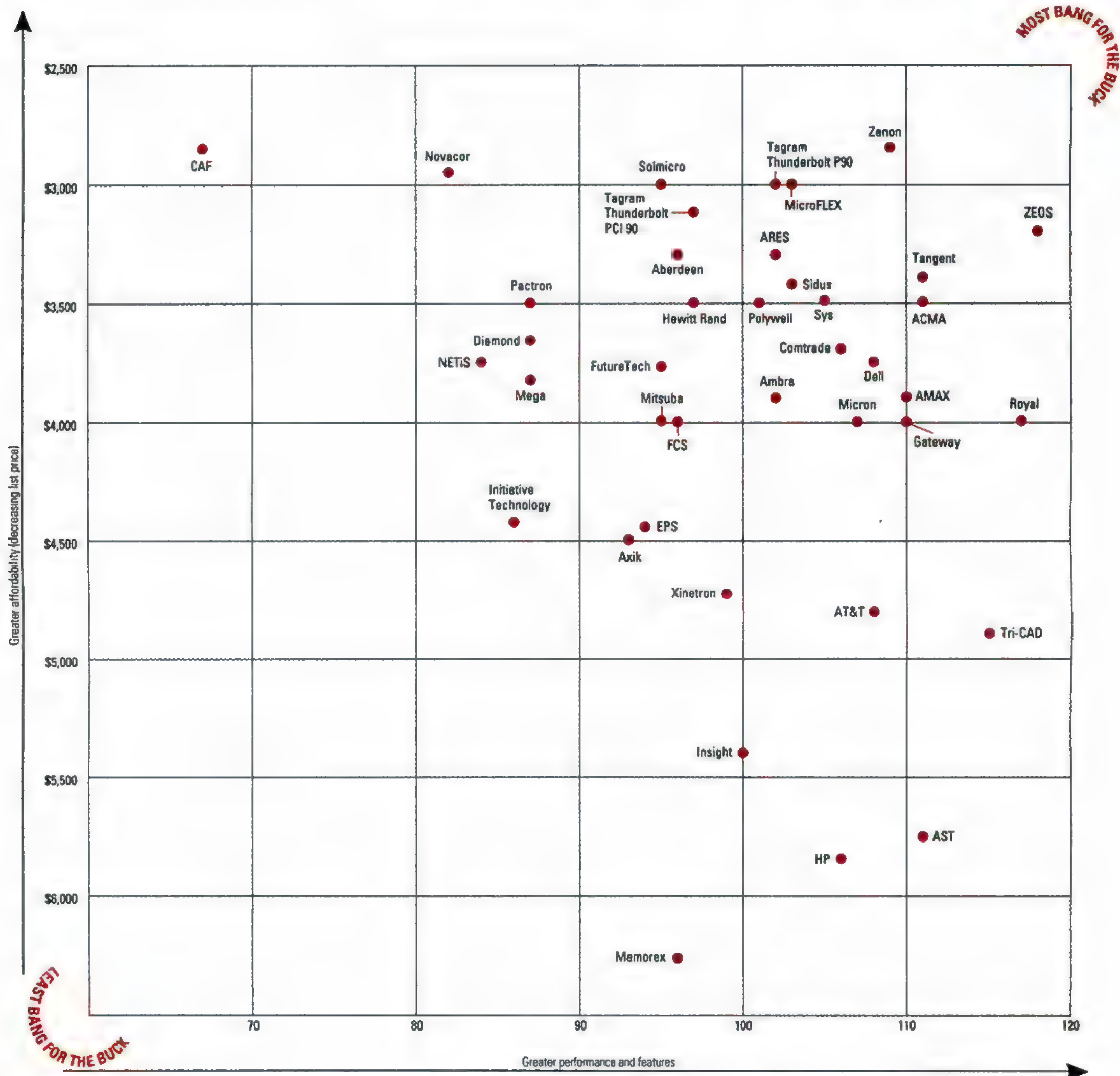
In this roundup of ultra-fast PCs, the ZEOS Pantera 90 offers the most bang for the buck. This system, reasonably priced at \$3,195 and a top performer under both DOS and Windows, suffers only one major shortcoming: limited expandability. Four ISA slots are partially blocked and therefore are not

able to accommodate full-length cards.

Just behind the ZEOS Pantera on our performance/features scale are the Royal Media Master IV and the Tri-CAD Vigor Pentium 90. Both of these machines, however, are more expensive than the Pantera: They are priced at \$3,995 and \$4,895, respectively. But the

Tri-CAD Vigor did earn an Editors' Choice award for its impressive performance and thoughtful design, which includes pull-out hard disks that support mirroring.

Behind these machines, five systems cluster close together in terms of performance and features: the ACMA P90



PCI, AMAX 90MHz PowerStation, Gateway 2000 P5-90, Tangent PCI-590, and Zenon Z-Titan Pentium 90MHz. Prices for these systems range from \$2,845 (for the Zenon system), which is the lowest price in this roundup, to \$3,999 (for the Gateway system).

Two other systems worthy of note are the Dell Dimension XPS P90 (\$3,749) and the Micron P90PCI PowerStation (\$3,999)—both competitively priced for this roundup. The Micron P90PCI offers very strong performance under Windows; the Dell Dimension offers plenty of hardware for your money, including a sound card and a 1GB hard disk.

The \$5,845 HP Vectra XU 5/90C and \$3,490 Sys Performance Pentium 90 Full Tower—both Editors' Choice winners—earned performance/features scores that place them in the middle of the pack. Hewlett-Packard's system carries the second-highest price of all the machines we tested. But it also delivers an abundance of features—including integrated Ethernet support—and solid service policies.

The CAF Lightning P9, bargain-priced at \$2,850, came up short on its performance/features score. It placed last or second-to-last on our Winstone, Graphics WinMark, Disk WinMark, processor, and DOS disk tests. Similarly, the Novacor Nova Pentium 90 sells for a low price of \$2,950 but also was a below-average performer on all of our Windows-based benchmark tests.

THE DATA POINTS

Benchmark tests account for 58 percent of each system's combined performance/features score. Factors such as hard disk capacity, monitor size, network support, and expandability account for another 37 percent. Service and support account for 5 percent. For more information, look in the Hardware Library of the Editorial Forum on PC MagNet under 16BANG.XLS.

► FACT FILE

Aberdeen Super P90 VLPCI

List price: \$3,295.

Processor/Memory:

Pentium/90, 16MB RAM, 512K external cache.

Data storage:

Maxtor 546MB IDE hard disk, Aberdeen VL-Bus disk controller card,

Sony CDU-33A-01 CD-ROM drive.

Display:

ATI Graphics ProTurbo 64 PCI video controller card with 2MB VRAM,

Tatung CM 15VDE 15-inch monitor with a 72-Hz refresh rate at 1,024-by-768.

Software:

DOS 6.2,

Microsoft Windows for Workgroups 3.11.

Aberdeen Inc.; 800-

552-6868, 213-725-

3366; fax, 213-725-

3366.

446 on reader service card



SUITABILITY TO TASK

Windows applications **GOOD**

DOS applications **GOOD**

Expandability **GOOD**

road, as was its Winstone score. The processor score was average, and despite below-average scores on our DOS-based video and disk tests, the unit posted an average DOSmark score.

Aberdeen includes a two-year parts and lifetime labor warranty; on-site service costs \$229.95 for a four-year contract.

In summary, although this system does not offer any big surprises, it does offer solid performance (especially under Windows) for a price that is decidedly reasonable for a Pentium PC.—William P. Flanagan

ACMA Computers Inc.

● ACMA P90 PCI

The ACMA P90 PCI offers reasonable expandability, strong performance, and well-integrated components. Its \$3,495 price tag is competitive and includes an NEC triple-speed CD-ROM drive. All in all, it's a system worth considering.

The tower case leaves you with room to grow. It offers six drive bays, all of which are front-accessible. In the unit we saw, three were taken by the CD-ROM drive, hard disk, and 3.5-inch floppy disk drive. For those who need more bays, ACMA ships a drive cage with this system that will add four more bays at no additional cost—though users will sacrifice

accessibility to two of the four SIMM sockets, and one of the ISA slots will be unable to take a full-length card.

Of the five ISA and three PCI slots (including one shared ISA/PCI slot), two were occupied by a CD-ROM controller and an ATI Graphics ProTurbo 64 video card with an ATI Mach 64 chip set and 2MB of VRAM.

Performance is another bright spot for the ACMA P90 PCI. The unit did well on most of our tests, posting above-average scores on our Winstone, Graphics WinMark, Disk WinMark, and DOS video tests. The unit's Conner hard disk, with an integrated PCI controller, also helped secure an above-average score on our DOS disk tests and an above-average DOSmark score. Its only average showing came on our processor tests, but all scores on these tests were tightly grouped. ACMA includes one year of free on-site service.—Anush Yeghazarian

► FACT FILE

ACMA P90 PCI

List price: \$3,495.

Processor/Memory:

Pentium/90, 16MB

RAM, 256K external

cache.

Data storage:

Conner 514MB IDE hard

disk, integrated PCI disk

controller, NEC CDR-

510 CD-ROM drive.

Display:

ATI Graphics

ProTurbo 64 PCI video

card with 2MB VRAM,

ADI MicroScan 4GP

SM-5515G 15-inch

monitor with a 72-Hz refresh rate at 1,024-by-768.

Software:

DOS 6.21,

Microsoft Windows

for Workgroups 3.11.

ACMA Computers

Inc.; 800-786-6868,

510-623-1212; fax,

510-623-0818.

447 on reader service card



SUITABILITY TO TASK

Windows applications **EXCELLENT**

DOS applications **EXCELLENT**

Expandability **GOOD**

AMAX Engineering Corp.

● AMAX 90MHz PowerStation

The AMAX 90MHz PowerStation has a lot to offer. For \$3,895, you get a tower case, 514MB of disk storage, 16MB of RAM, a 17-inch monitor, and very solid Windows applications performance. It's



GE Rental/Lease



It's a downright liberating idea. Because, quite simply, GE Rental/Lease can help deliver you from the high cost of buying and maintaining all your PCs and work-

stations. That means you can use your capital to build bigger profits, and GE's capital to build bigger systems. What's more, you can try today's brave, new tech-

nologies without being locked into any of them. And since GE offers a world-class rental inventory of new computer equipment, you'll have the freedom to choose

You'll find our rental computers everywhere.



whatever you need from the biggest
names in the industry—backed by skillful
technical specialists and GE's ISO 9002-
registered quality program. You'll also

know that we can get all your equipment
where it has to go, when it has to get there.
So when you're ready to rent computers,
call the one number that works everywhere:
CIRCLE 083 ON READER SERVICE CARD



1-800-GE-RENTS

© 1994 GE Capital. All rights reserved. ISO 9002 Registered

■ The Future of the x86 Architecture

By Jim Seymour

With AMD, Cyrix, Texas Instruments, and others now selling Intel-compatible 486 chips at close to commodity prices, it's clearly in Intel's best interest to make the 486 obsolete as quickly as possible and accustom the market to a performance level that's available from only one source. But by the end of this year, we expect to see "Pentium-class" CPUs from no fewer than three manufacturers of x86-compatible processors, which may translate into better PC prices for consumers.

THE COMPETITION

Three direct competitors of the Pentium chip have been announced so far. NexGen's Nx586 will be the first to arrive and will probably be the least expensive of the three; it's aimed squarely at the low-cost-PC marketplace. Cyrix's "M1" architecture appears to be the most aggressive in its exploitation of advanced-microprocessor-design implementation. AMD's "K5" is the stealth contender; the company has revealed next to nothing about the processor's internal structure.

The Nx586 achieves its low price largely by shedding the floating-point unit that few mainstream applications ever use. Instead, NexGen sells a separate Nx587 floating-point coprocessor. The Nx586 also integrates a controller for external processor cache onto the CPU itself, reducing the cost of the core-logic chip set. NexGen estimates that Nx586-based PCs will sell for under \$2,000 when they begin shipping in the next few weeks.

Internally, the Nx586 is a hybrid of an x86 CPU and a RISC CPU. It converts x86 instructions into an

internal format that NexGen calls RISC86. RISC86 instructions are consistently formatted and of a constant length, letting the Nx586's core exploit performance-improving strategies such as out-of-order execution and register renaming.

Cyrix designed its M1 architecture to provide optimal performance without requiring code optimization, as Pentium requires. M1, like Pentium, can execute two integer

instructions per clock cycle. But Cyrix maintains that M1 can process instructions more efficiently than Pentium, which can execute two instructions simultaneously only under very specific conditions. Cyrix promises that M1 will appear in systems by year-end and will support clock frequencies of 100 MHz or higher.

You'll also see M1 processors from IBM Microelectronics,

which is actually fabricating both the Cyrix and NexGen processors and has an agreement that lets it sell individual Cyrix-designed CPUs. Previously, IBM was able to produce CPUs based on Intel designs (Blue Lightning, for example) but could sell them only on motherboards or in complete systems.

AMD won't comment on its K5 processor, except to say that it will be capable of executing as many as four instructions per clock cycle. The company will disclose more details by the end of the year.

THE FUTURE OF PENTIUM

Intel's next step up the performance ladder will be the 100-MHz Pentium. Next year, we'll probably see a 133-MHz Pentium and, eventually, a 150-MHz Pentium. □

*Increased CPU
competition
spells good news
for PC buyers
since it trans-
lates into even
more aggressive
system pricing.*

► FACT FILE

AMAX 90MHz PowerStation

List price: \$3,895.

Processor/Memory:

Pentium/90, 16MB

RAM, 256K external

cache. **Data storage:**

Conner 514MB IDE hard

disk, integrated PCI disk

controller, Chinon CDS-

535 CD-ROM drive,

Impression PCMCIA

dual-card drive. **Dis-**

play: ATI Mach 64 PCI

video controller card

with 2MB VRAM, MAG

InnoVision MAGMX17 17-inch monitor with a 72-Hz

refresh rate at 1,024-by-768. **Software:** DOS 6.21,

Microsoft Windows

for Workgroups 3.11.



SUITABILITY TO TASK

AMAX Engineering

Corp.; 800-800-6328,

510-651-8886; fax,

510-651-4119.

448 on reader service card

Windows
applications

EXCELLENT

DOS

applications

EXCELLENT

Expandability

GOOD

definitely worth a close look.

This unit's uncluttered case has eight drive bays, four of which were still free (three internal, one front-accessible) in our test configuration. The others were occupied by a 3.5-inch floppy disk drive, a double-speed CD-ROM drive, and a hard disk, as well as a noteworthy addition: two stacked Type II PCMCIA slots, which are standard on this unit.

The AMAX PowerStation also has five ISA and three PCI slots (one ISA and one PCI slot share the same backplate); in the unit we saw, all but three of these slots were free. Two of the ISA slots were occupied by the PCMCIA and CD-ROM drive controllers, while an ATI Mach 64 graphics card with 2MB of VRAM took up one of the PCI slots. Main memory is expandable to 128MB through the four SIMM slots on the Intel motherboard. Though it was not sent with our unit, a Creative Labs Sound Blaster 16 SCSI sound card is now also standard.

Performance was very strong on all of our benchmark tests. The AMAX PowerStation did especially well on our video tests under both DOS and Windows: The system's scores on both of these tests were well above the group average. Its Winstone score ranked among the top five.

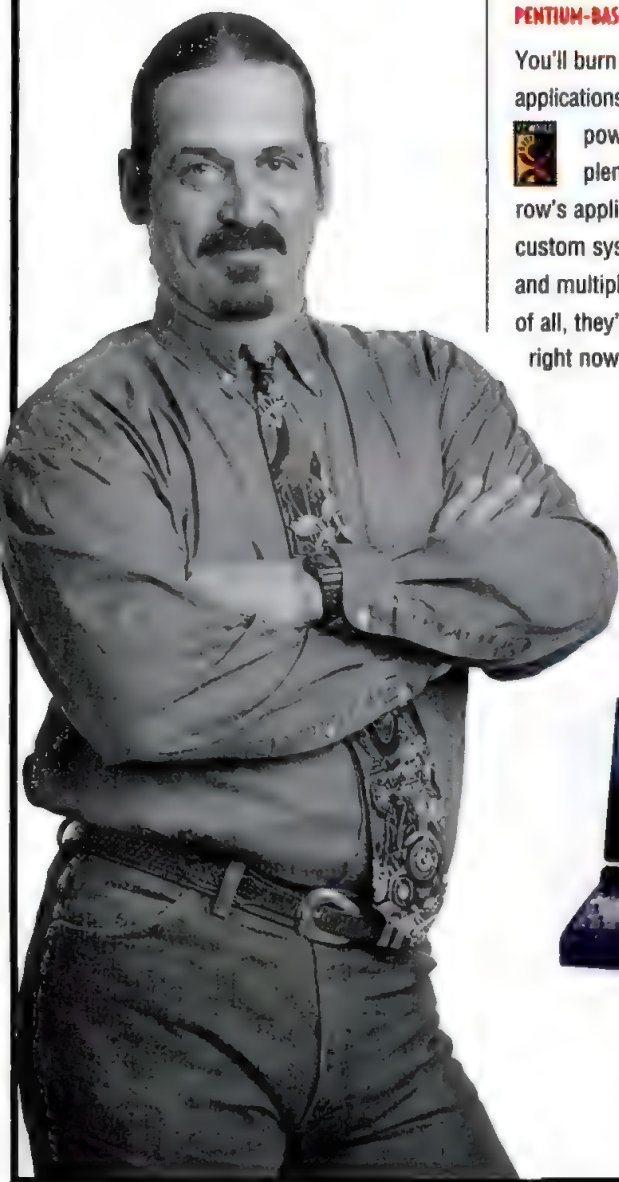
The Conner hard disk and integrated

EARL HAS SOME BUSINESS TO TAKE CARE OF.



AT THE OFFICE OR ON THE ROAD, HE TURNS TO AUSTIN DIRECT.

At home or on the road, Earl gets the job done. Because he turned to Austin Direct for the tools he needs. Like a racy little notebook for when it's time to hit the street. And a speedy desktop system for when he's hanging out at the office.



DX4-DRIVEN NOTEBOOKS. COOL.

For the ultimate in laptop performance, choose Austin's new DX4-powered notebooks. Intel's DX4 chip is the most powerful technology available for notebooks today. And our laptops have the expandability and flexibility that make them a tough gang to beat.



PENTIUM-BASED DESKTOPS. RAW POWER.

You'll burn rubber through today's desktop applications with Austin's new Pentium-powered desktop computers. With plenty of power to handle tomorrow's applications too. Austin Direct offers custom systems, flexible configurations, and multiple upgrade options. And best of all, they're affordable – and available right now.



KILLER SERVICE AND SUPPORT.

- ✓ An average tech support response time of *under two minutes*
- ✓ Award-winning systems
- ✓ Top rated service and support
- ✓ Lifetime tech support seven days a week, *twenty-four hours a day*
- ✓ *Three year warranty* on desktops: first year on-site, second and third year parts and labor
- ✓ One year warranty on notebooks
- ✓ 30-day money back guarantee



THE WORD'S OUT ON THE STREET.

"...among the new class of portables, these fine components add up to a hard-to-beat combination."

PC Magazine, December 1993

"Blazing Performance."

Windows Magazine, January 1994

"If you're looking for the most speed and capacity for your dollar, this is the system for you."

Home Office Magazine, March 1994



CHOOSE ONE THAT'S RIGHT FOR YOU.

\$1,639 GENESIS 486DX2-66 - Intel 486DX2-66 Processor 4 MB RAM, 128 KB Cache 212 MB Hard Drive 1 MB Local Bus Windows Accelerator for 1024 x 768 - Double Speed CD-ROM 3.5" 1.44 MB Diskette Drive 14" SVGA Monitor 5 16-bit ISA Slots 101-Key Keyboard & Mouse - MS-DOS 6.21, Windows 3.11, & MS Works 3.0 - EPA Energy Star Compliant - Lease \$65/mo	\$2,099 THE EDUTAINER - Intel 486SX-33 Processor 8 MB RAM, 128KB Cache 212MB Hard Drive 1 MB Local Bus Windows Accelerator for 1024 x 768 3.5" 1.44 MB Diskette Drive 14" SVGA Monitor, 16-bit Sound Card - Video playback using MPEG1 - Sony Double-Speed CD-ROM 5 16-Bit ISA Slots 101-Key Keyboard, Mouse, & Speakers - MS-DOS 6.21, Windows 3.11, & MS Works 3.0 - EPA Energy Star Compliant - Lease \$83/mo	\$1,819 PREMIER 486DX2-66 - Intel 486DX2-66 Processor 8 MB RAM, 128 KB L2 Cache 425 MB Hard Drive 1 MB Local Bus Windows Accelerator for 1024 x 768 - Double Speed CD-ROM 3.5" 1.44 MB Diskette Drive 14" SVGA Monitor 2VL and 5 16-bit ISA Slots 101-Key Keyboard & Mouse - MS-DOS 6.21, Windows 3.11, & MS Works 3.0 - EPA Energy Star Compliant - Lease \$72/mo	\$2,149 POWER SYSTEM-60 - Intel 60MHz Pentium Processor 8 MB RAM, 256 KB L2 Cache 425 MB Hard Drive - PCI-Bus Windows Accelerator with 1 MB - Double Speed CD-ROM 3.5" 1.44 MB Diskette Drive 14" SVGA Monitor 2 PCI, 1 PCI/ISA and 4 ISA Slots 101-Key Keyboard & Mouse - MS-DOS 6.21, Windows 3.11, & MS Works 3.0 - Lease \$85/mo
\$2,299 POWER SYSTEM-66 - Intel 66 MHz Pentium Processor 8 MB RAM, 256 KB L2 Cache 425 MB Hard Drive - PCI-Bus Windows Accelerator with 1 MB - Double Speed CD-ROM 3.5" 1.44 MB Diskette Drive 15" NI SVGA Monitor 2 PCI, 1 PCI/ISA and 4 ISA Slots 101-Key Keyboard & Mouse - MS-DOS 6.21, Windows 3.11, & MS Works 3.0 - Lease \$91/mo	\$2,849 POWER SYSTEM-90 - Intel 90 MHz Pentium Processor 8 MB RAM, 256 KB L2 Cache 425 MB Hard Drive - PCI-Bus Windows Accelerator with 2 MB - Double Speed CD-ROM 3.5" 1.44 MB Diskette Drive 15" NI SVGA Monitor 2 PCI, 1 PCI/ISA, and 4 ISA Slots 101-Key Keyboard & Mouse - MS-DOS 6.21, Windows 3.11, & MS Works 3.0 - Lease \$113/mo	\$3,399 AUSTIN PCI-PS SERVER - Intel 66 MHz Pentium Processor 16 MB RAM, 256 KB L2 Cache 1.08 GB SCSI-2 Hard Drive, SCSI-2 Controller 3.5" 1.44 MB Diskette Drive 14" SVGA Monitor 1 MB Video Adapter 10-BASE T Ethernet Adapter - Tower Case, 8 Drive Bays 2 PCI, 1 PCI/ISA, and 4 ISA Slots 101-Key Keyboard & Mouse - MS-DOS 6.21 - Lease \$135/mo	SYSTEM UPGRADES - Multimedia Kit (Double Speed CD-ROM, Media-Magic ISP-16 Sound Card, and Speakers), \$259 425 MB to 540 MB hard drive upgrades, \$90 15-inch monitor upgrade from 14-inch, \$90 (Only with system purchase.) We can build a custom system to your specifications! Ask your Austin Direct sales representative about additional hard drive, RAM, and processor options.
AUSTIN NOTEBOOKS - Intel 486SX, DX2 or DX4 Processors 4 MB or 8 MB RAM Expandable to 32 MB 127 MB to 524 MB IDE Drive, User Replaceable 3.5" 1.44 MB Diskette Drive - Local Bus Video with 1 MB VRAM - Local Bus IDE 9.5" Monochrome, DSTN or TFT Active Color Screen 2 Type II or 1 Type III PCMCIA Slots - Integrated 16mm Trackball - DX4 Series 16-Bit Business Audio Features Including Built-In Microphone and Speaker, External Jacks for Line In and Line Out - EPP/ECPP Parallel Port, 16550 High Speed Serial Port - Advanced Power Management 1 Parallel, 2 Serial, Keyboard Port, VGA Port - Dimensions: 11.1" x 8.58" x 2" - Weight: 6.3 lbs. with battery	DUAL SCAN SCREEN \$2,029 AUSTIN 486SX-33 4 MB RAM and 262 MB Hard Drive - Lease \$81/mo \$2,229 AUSTIN 486DX2-50 4 MB RAM and 262 MB Hard Drive - Lease \$89/mo \$2,579 AUSTIN 486DX2-66 8 MB RAM and 340 MB Hard Drive - Lease \$94/mo \$2,849 AUSTIN 486DX4-75 8 MB RAM and 340 MB Hard Drive - Lease \$113/mo \$3,199 AUSTIN 486DX4-100 8 MB RAM and 524 MB Hard Drive - Lease \$127/mo	ACTIVE MATRIX SCREEN \$3,149 AUSTIN 486SX-33 4 MB RAM and 340 MB Hard Drive - Lease \$125/mo \$3,299 AUSTIN 486DX2-50 4 MB RAM and 262 MB Hard Drive - Lease \$131/mo \$3,489 AUSTIN 486DX2-66 8 MB RAM and 340 MB Hard Drive - Lease \$139/mo \$3,899 AUSTIN 486DX4-75 8 MB RAM and 524 MB Hard Drive - Lease \$155/mo \$4,099 AUSTIN 486DX4-100 8 MB RAM and 524 MB Hard Drive - Lease \$127/mo	MONOCHROME SCREEN \$1,439 AUSTIN 486SX-33 4 MB RAM and 127 MB Hard Drive - Lease \$57/mo \$1,739 AUSTIN 486DX2-50 4 MB RAM and 262 MB Hard Drive - Lease \$69/mo \$1,958 AUSTIN 486DX2-66 8 MB RAM and 127 MB Hard Drive - Lease \$78/mo
ROAD WARRIOR PACKAGE - Premium Notebook Carrying Case 14.4 Internal Fax/Modem - Car Power Adapter - External Charger - NiMH Spare Battery Back (Separately, \$585) Package Price, \$490	NOTEBOOK ACCESSORIES 4 MB RAM, \$219; 16 MB RAM, CALL; Docking Station, \$299; Car Adapter, \$59; PCMCIA 14.4 Fax/Modem, \$299; Built-In 14.4 Fax/Modem, \$199; PCMCIA Ethernet Adapter, \$220 (Only with system purchase.) Ask your Austin Direct sales representative about additional configurations.		



AUSTIN DIRECT

1-800-752-1577

2121 Energy Drive, Austin, Texas 78758
512-339-3500 • FAX 512-454-1357

Government Sales: 1-800-833-4472

Fortune 1000 Sales: 1-800-622-5506

For More Information By Fax: 1-800-341-7500

Ad Code: PCM092794

©1994 Austin Direct. All rights reserved. The Intel Inside logo is a registered trademark of Intel Corp. Intel DX4, DX2, DX are trademarks of Intel Corp. Microsoft is a registered trademark and Windows and the Windows logo are trademarks of Microsoft Corp. All other company names and products are trademarks or registered trademarks of their respective owners. The above are special promotional prices. Prices and specifications are subject to change without notice. We are not responsible for errors in typography and photography. *Lease term reflects 36-month contract.

CIRCLE 012 ON READER SERVICE CARD

PCI controller helped the AMAX PowerStation generate above-average scores on our DOS disk and Disk WinMark tests. Boosted by strong DOS video and DOS disk results, the system's DOSmark score was also above average. The processor score was average.—AY

Ambra Computer Corp.

• Ambra TP90PCI

At a price of \$3,899, the Ambra TP90PCI offers some appealing extras, including a 16-inch monitor and a larger-than-average 731MB hard disk. But although this system demonstrated strong performance on our Windows-based applications and

▶ FACT FILE

Ambra TP90PCI

List price: \$3,899.

Processor/Memory:

Pentium/90, 16MB RAM, 256K external cache.

Data storage:

Western Digital 731MB IDE hard disk, integrated PCI disk controller, Philips LMS CDR206 CD-ROM drive.

Display:

Diamond Viper PCI video card with 2MB VRAM, Acer Peripherals BMS4000

16-inch monitor with a 70-Hz refresh rate at 1,024-by-

Software:

DOS 6.2, Microsoft Windows 3.1.

Ambra Computer Corp.; 800-252-6272, 602-858-2600.

449 on reader service card



SUITABILITY TO TASK

Windows applications **GOOD**

DOS applications **GOOD**

Expandability **GOOD**

disk tests, it demonstrated below-average graphics performance under both DOS and Windows. In July, Ambra announced that it would be closing its doors this fall.

Internally, this mini-tower system is comparatively neat and not overly crowded by cables. Like many of the systems in this roundup, the Ambra TP90PCI uses an Intel motherboard with the Neptune chip set. But Ambra did not block access to the SIMM sockets or expansion slots by trying to cram in too many drive bays (the unit includes six) or expansion boards. The motherboard has an integrated disk controller, which—when teamed up with the 731MB Western Digital hard disk—

What the Numbers Mean

These Pentium/90 systems are about 40 percent faster than the Pentium/60 and Pentium/66 units we have tested in the past. The variation in results among the tested systems also illustrates how differences in critical componentry such as core-logic chip sets and disk subsystems can dramatically influence performance.

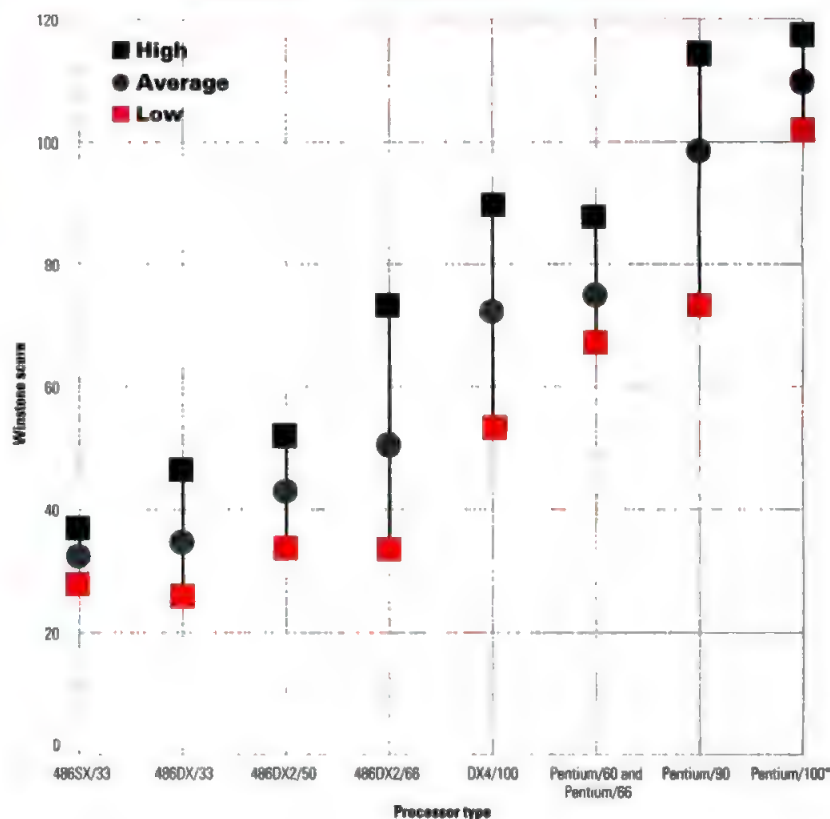
Winstone and Graphics WinMark test results demonstrated a remarkable trend. When comparing systems with similarly powerful disk and graphics subsystems, we found that machines using Intel's 82434NX Neptune core-logic chip set consistently outperformed those based on OPTi's 82C546/82C547 Python and 82C596/82C597 P7M-WB-V chip sets. In fact, nearly all of the machines that achieved above-average Winstone scores used the Neptune chip set. We saw a performance differential of 10 percent between comparably equip-

ped OPTi- and Neptune-based systems.

The Neptune chip set supports PCI and a faster-tuned burst-transfer mode, which combine to push PCI-based graphics cards (and Winstone performance) to new heights. The OPTi chip set, on the other hand, is fundamentally a VL-Bus-specific solution that supports PCI through the use of a bridge chip. This implementation imposes extra delays in PCI-bus transfers. The OPTi chip sets also suffer from a synchronization problem

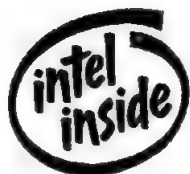
(continues)

Pentium/90: Onward and Upward



* We tested two Pentium/100-based prototype machines

How to wield power without throwing around a lot of weight



- **Lightweight** - Featuring Full Sized 83 Key Keyboard & 9.5" Display
- **Built-In 16bit DSS (Digital Sound System)** For CD Stereo Sound
- **Upgradable Monochrome, Dual Scan Passive or Active Matrix Display**
- **Choice of Intel SL Enhanced CPU's** - 486SX-33, DX2-50, DX4-75 or DX4-100
- **RAM Upgradable to 20MB**
- **Removable Hard Drive** From 200-500MB
- **1MB 32 bit VESA Local Bus Video** and Accelerated I/O.
- **Supports both NiMH and Standard AA Batteries**, Utilizes SMM and 3.3v Technologies
- **Built-In 19mm Center Trackball With Palmrest**
- **Includes External 1.44MB Floppy**
- **PCMCIA Type III**
- **User Upgradable: CPU, RAM, Hard Drive and Display**
- **Choice of 3 Optional Docking Stations:** Multimedia, Slimline and Port Replicator for true Desktop Power
- **Dimensions:** 13.4" H x 8.5" D x 11" W
- **Includes:** Dos 6.21, Windows for Workgroups 3.11, Windows Sound System Software, Performance Speakers, NiMH Battery, AC Adapter and Carrying Case.
- **3 Year Warranty**

Starting At:
\$1995.00
 Monochrome 4MB RAM,
 200MB Hard Drive
 Dealer pricing may vary

Every day, you face big opponents with bigger resources. When you hook, they jab. When you punch, they counterpunch. To win it all, you need more than just another notebook computer. You need a partner who knows the ropes. A real professional. Like the SoundWave from AMS.

At under four pounds, the SoundWave is a solid lightweight. But its heavy-weight computing power is a match for any situation. Its technical qualifications are beyond question. You can start the early rounds with the solid performance of the Intel SL Enhanced 3.3 volt 486SX-33 CPU, its standard 4MB of RAM and high resolution Monochrome display. Or to go the distance, easily upgrade to the stunning power of the Intel 486DX4-75 or 100Mhz CPU, 8 or even 20MB of ram, up to 520MB of hard disk storage, and the awe-inspiring clarity of our advanced Dual-Scan or Active Matrix Color Displays.

Pound for pound, no other notebook is even a contender. And even though many in its weight class force you to settle for less, this champion gives you everything you expect in a world-class notebook.

A full sized 83 key keyboard, large 19mm center trackball with palmrest, Type III PCMCIA slot, and a full 9.5" diagonal display. Throw in our standard 1MB of local bus video, local bus accelerated I/O and Hard Drive, and you can see why the SoundWave dances circles around the competition.

This kind of performance may sound too good to be true, but you ain't heard nothin' yet. Because the SoundWave truly lives up to its name by including Full stereo 16bit digital sound for CD Quality recording and playback and comes complete with Windows Sound System software and our amazing high performance portable speakers.

Of course, we've known all along the SoundWave would be the greatest. But we found one more advantage we could give you before you step in the ring. We've added an unbeatable cover to cover - 3 year parts and labor warranty. Could someone please ring the bell now?

The SoundWave from AMS. By Unanimous Decision, a technical knockout.

Call For A Dealer Nearest You 800 267-6438

12881 Ramona Blvd. Inwindale, CA. 91706 Corp. (818) 814-8851 Fax (818) 814-0782 FaxBack Service (800) 868-8148

CIRCLE 270 ON READER SERVICE CARD

AMS

between the processor and the VL-Bus, which sometimes results in brief delays when communicating with peripherals.

These factors left the OPTi systems lagging. The OPTi system with the highest Winstone score was Micro Express's MicroFLEX-VL/Pentium/90, which uses VL-Bus but not PCI. Among the OPTi-based systems that implement both PCI and VL-Bus—a far more common configuration—the FutureTech System 5490P generated the best Winstone score. That score, 100.2, was barely above the group average of 98.8.

This disparity was magnified in the Graphics WinMark results. Among the systems using a given graphics adapter, the highest Graphics WinMark scores were always produced by the machines with Neptune chip sets.

A look at burst-read memory timings for various machines is revealing, too. The systems with Intel chip sets typically employed a 3-2-2-2 timing pattern; this means that when a processor requests 256 bits (32 bytes) of data to refill a line in its on-board cache, the external processor cache takes three bus clock cycles to deliver the first 64 bits and two clock cycles for each of the three remaining groups of 64 bits, for a total of nine clock cycles. During our tests, only the best-tuned systems based on the OPTi chip sets could match this timing. The worst OPTi-based machines were set for a 4-3-3-3 timing, which required a total of 13 clock cycles for a 256-bit transfer—an additional overhead of almost 50 percent on cache line fills.

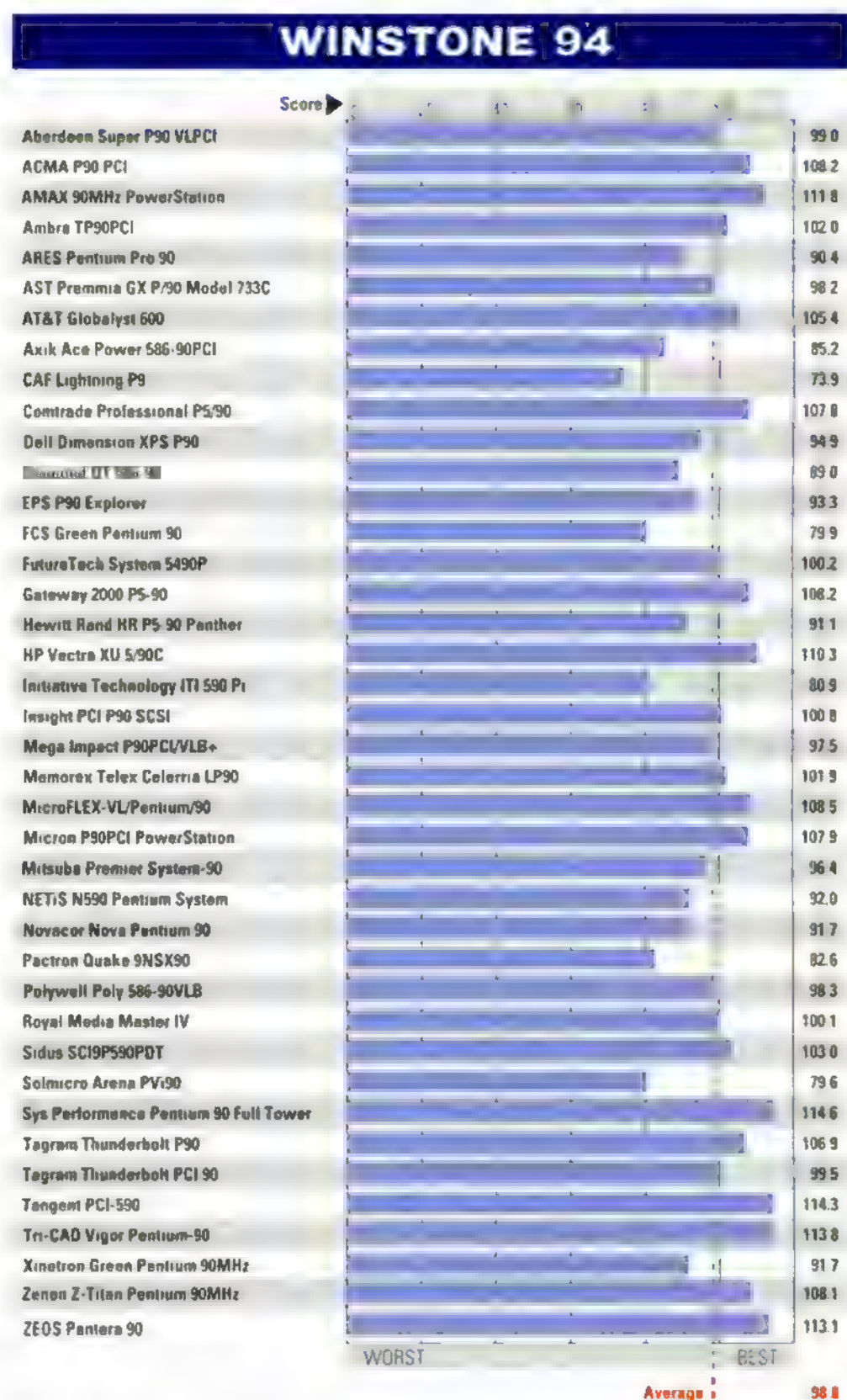
The lesson is: If the combination of VL-Bus and PCI appeals to you because of its broader compatibility, be forewarned that combining VL-Bus and PCI can exact a performance toll.

A DEATH KNEEL FOR SCSI ON THE DESKTOP?

It's long been held that SCSI is the interface of choice for high-end disk subsystems, but the Disk WinMark test results demonstrated a clear advantage for IDE-based hard disks. Systems with IDE disks captured the entire top half of our Disk WinMark results, relegating SCSI systems to the basement. The only poor IDE-based performers were machines with disk subsystems that were incompatible with 32-bit disk access under Windows; this reduced performance to the level of the SCSI-based systems.

IDE's appeal will grow as Enhanced IDE becomes more commonplace. Enhanced IDE's biggest selling point is performance: Its Mode 3 PIO transfer mode supports a fast 11.1-megabyte-per-second data-transfer rate. In addition, Enhanced IDE provides 32-bit-wide data transfers between the disk device driver and the IDE interface, as well as support for block-mode transfers. Full implementations of Enhanced IDE can support up to four drives, and they also support disks larger than the traditional IDE-under-DOS limitation of 528MB and ATAPI-compliant CD-ROM drives.

Different machines and disk subsystems implement Enhanced IDE to different extents, and right now there's no simple way to determine whether a system is fully Enhanced IDE-compliant. In the long term, though, we expect that IDE and its newly increased abilities will continue to displace SCSI except in environments where maximum expandability is critical.



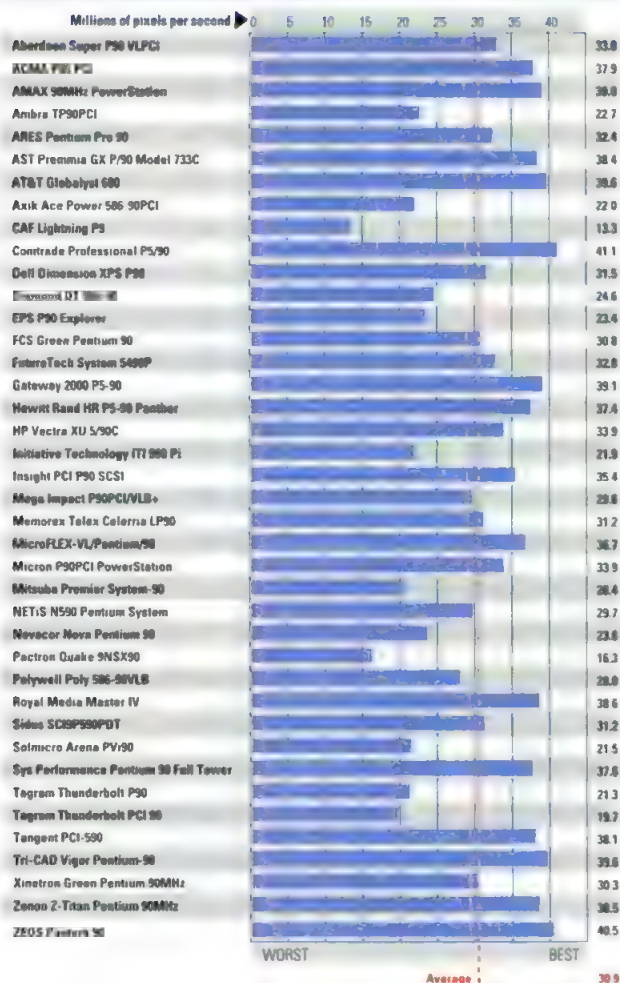
WHAT MAKES A WINNER

Some exceptional performers emerged among the 40 machines we tested. The Sys Performance Pentium 90 Full Tower set a record on our Winstone test, with a score of 114.6. Three other units—the Tangent PCI-590, the Tri-CAD Vigor Pentium-90, and the ZEOS Pantera 90—scored within 2 percent of the Sys machine, creating a virtual tie for first place.

Even the slowest Pentium/90 systems can handle DOS applications adequately, so we don't consider differences in performance on our DOS tests to be particularly significant except to the extent that they indicate the stronger and weaker subsystems in each machine. We did witness a record DOSmark score: 1,429, posted by the Dell Dimension XPS P90.

Processor scores were very closely grouped. The highest-scoring unit was the HP Vectra XU 5/90C, with an impressive result of 104.3. The HP Vectra scored slightly lower than a nearly identical unit in our June 28 roundup of 90-MHz Pentiums, in part because this time around it was sent to us with a 10-nanosecond external processor cache (rather than a 9-ns cache).

GRAPHICS WINMARK



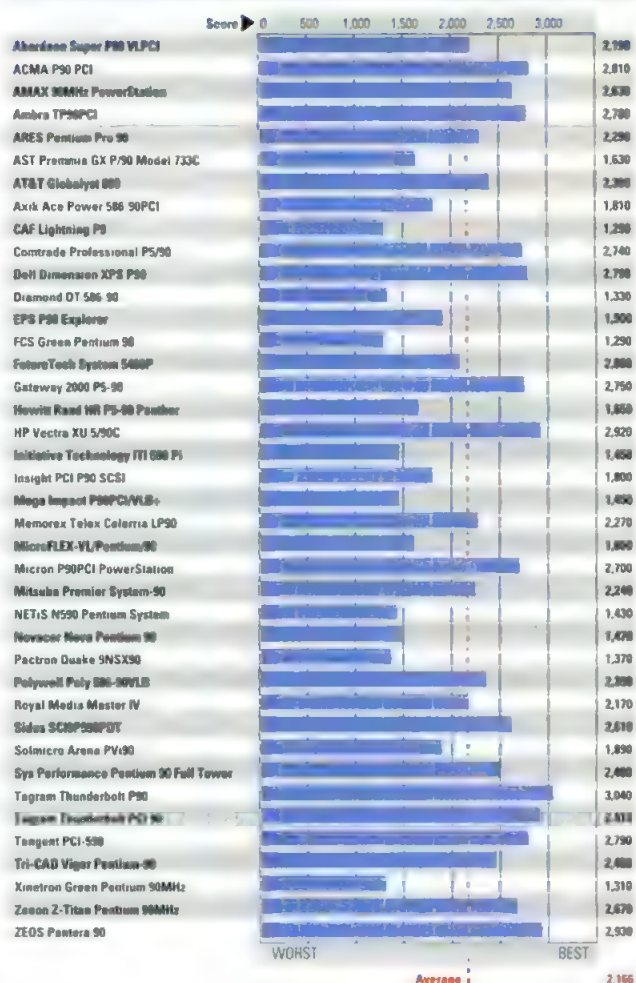
WINSTONE RESULTS

Our Winstone results—the best indicator of overall system performance when running typical Windows-based business applications—showed a tightly clustered group of high-performance leaders. The first-place finisher, the Sys Performance Pentium, came with a Micropolis Enhanced IDE hard disk, 512K of synchronous SRAM processor cache, and an ATI Mach 64-based PCI graphics card. The Tangent PCI-590, which missed first place by a fraction, had 256K of synchronous SRAM processor cache and a Diamond Stealth Pro 64 graphics card.

The third-place system, the Tri-CAD Vigor, combined synchronous SRAM with an 8MB Tekram IDE caching controller and an ATI Mach 64-based PCI graphics card to boost its Windows performance. Its second-highest Graphics WinMark and Disk WinMark scores propelled the ZEOS Panthera to fourth place, just a sliver behind the Tri-CAD Vigor.

The slowest performers—the CAF Lightning P9, the Solmicro Arena PVi90, and the FCS Green Pentium 90—could not match the performance of the best DX4/100 and Pentium/60 machines we've tested. Their subsystem performance was consistently below average.

DISK WINMARK



GRAPHICS AND DISK WINMARK RESULTS

The Comtrade Professional P5/90, using a Diamond Stealth Pro 64 graphics adapter with 4MB of VRAM, took first place on our Graphics WinMark tests, with a score of 41.1 million pixels per second. Close behind was the ZEOS Panthera, which scored 40.5 million pixels per second and had a more typical 2MB of VRAM on its Diamond Stealth Pro 64 adapter.

As a group, systems with ATI Graphics ProTurbo cards scored a little lower than those with Diamond Stealth Pro 64 cards. The AT&T Globalyst 600 and the Tri-CAD Vigor tied for the highest Graphics WinMark score among systems using ATI graphics cards; each posted a score of 39.6 million pixels per second. The top Matrox card, in the Insight PCI P90 SCSI, helped that unit score a very respectable 35.4 million pixels per second.

The performance differential between Neptune- and OPTi-based systems was magnified on our Graphics WinMark tests. The Comtrade Professional, for example, scored almost 70 percent higher than the top-performing OPTi-based system with the same Diamond Stealth Pro 64 graphics adapter and driver revision.

He Grew Up With MTV. He
And, Unfortunately, He'll B



Gets 300 Cable Channels. e In Your Audience Today.

Introducing Z-NOTEFLEX™, The Ultimate Multimedia Presenter.

Audience attention spans are short. And if they snooze, you lose.

So what you need is a way to make your presentations really worth watching. A way like the Z-NOTEFLEX system, from Zenith Data Systems.

With the Z-NOTEFLEX system, you get the capabilities of a multimedia workstation built around a powerful notebook computer that you can carry in your hand

Inside, its high-speed Intel 486 processor and fast local bus deliver sharp, colorful images and full-motion video certain to get attention. Particularly when the LCD display is detached and positioned in your viewers' direction.*

Of course, no multimedia-ready system would be complete without a CD-ROM drive.** And the built-in, 16-bit audio, microphone and stereo speakers make



Z-NOTEFLEX
up to
IntelDX4™ 75MHz processor
16-bit business audio
active-matrix, 256-color
LCD display

FLEXSITE
LCD display stand

FLEXBAY
battery charging bay
floppy drive bay

FLEXDOCK
enhanced port replicator
two type-III PCMCIA slots
networking module

FLEXSHOW™
double-speed CD-ROM drive
amplified stereo speakers
two type-III PCMCIA slots
integrated power supply

the Z-NOTEFLEX system truly a sound investment.

The Z-NOTEFLEX is modular, too. Its processor, memory, drives and display are all user-upgradable. Optional FLEX modules and PCMCIA slots support a wide range of system enhancements, multimedia capabilities and peripheral solutions.

You simply order the features you want today, then add others later as the need arises.

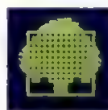
No other notebook makes it so easy to connect—with co-workers, with customers, in the office, or out in the field. But that's what people are learning to expect from ZDS.

To see what you can expect from the Z-NOTEFLEX, call us. Your audience will thank you.

1-800-945-0673, Ext. 5117

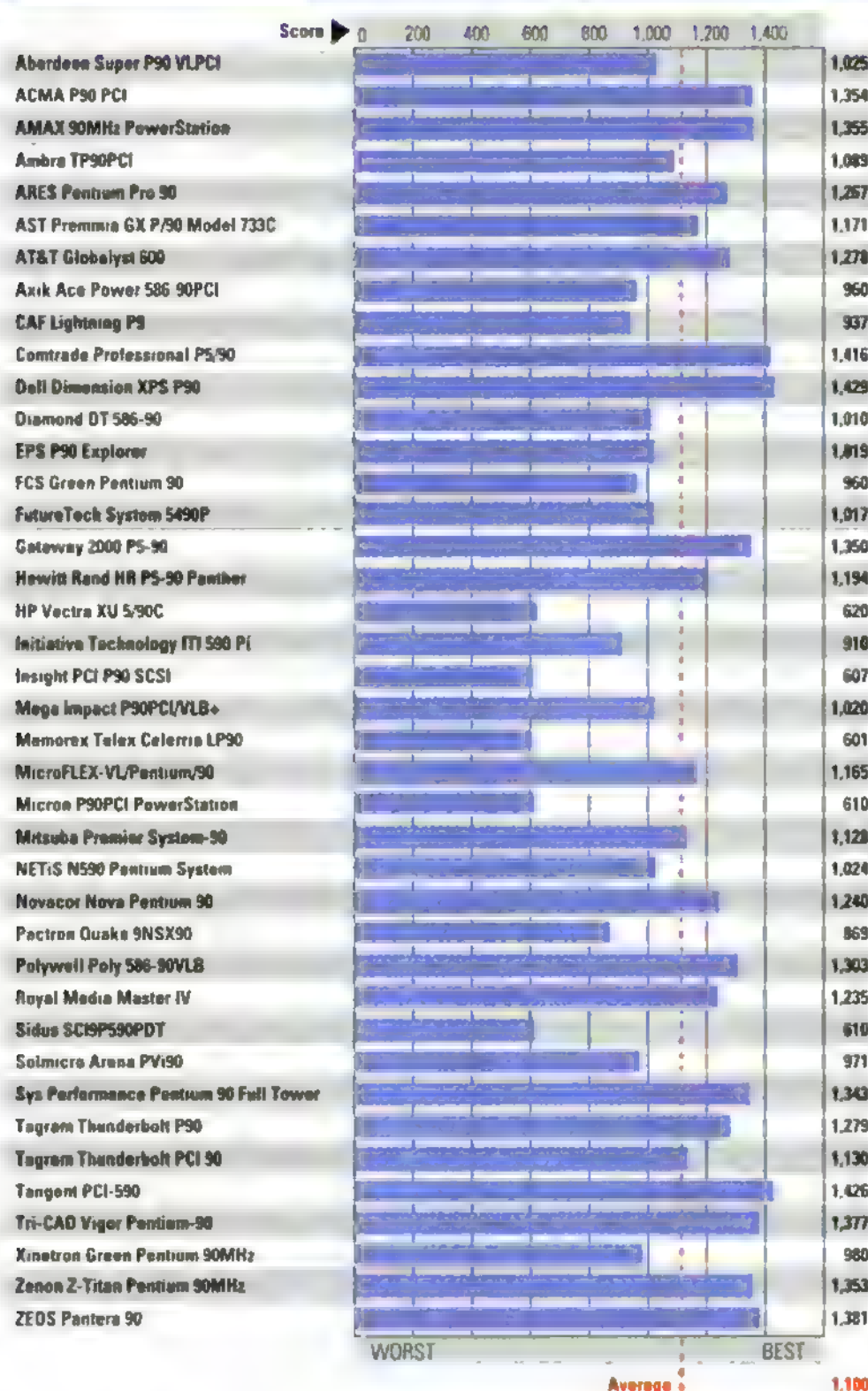


ZENITH
DATA SYSTEMS



Make The Connection™

DOSMARK



PROCESSOR



On our Disk WinMark tests, IDE demonstrated clear superiority over SCSI. Of the 40 tested systems, 28 used IDE disk subsystems; the top 22 Disk WinMark scores were turned in by IDE-based machines. The lower-scoring IDE-drive-based systems did not have Western Digital-compatible controller cards and therefore did not let us turn on 32-bit disk access under Windows.

We tested the systems with a 2MB SmartDrive cache set for write-back caching. On those systems running Microsoft Windows for Workgroups, we also activated 32-bit file access with a 2MB file cache and loaded SmartDrive with the option of reducing its size to 128K to avoid conflicts with the file cache. This 32-bit file-caching capability under Windows for Workgroups gave the edge to units with that operating system; the top seven Disk WinMark scores went to systems running Windows for Workgroups. The Tagram Thunderbolt P90, with a Maxtor MXT540A 8.5-millisecond Enhanced IDE drive, led the pack with a Disk WinMark score of 3,040.

DOS TEST RESULTS

As mentioned above, the Dell Dimension XPS P90 achieved an

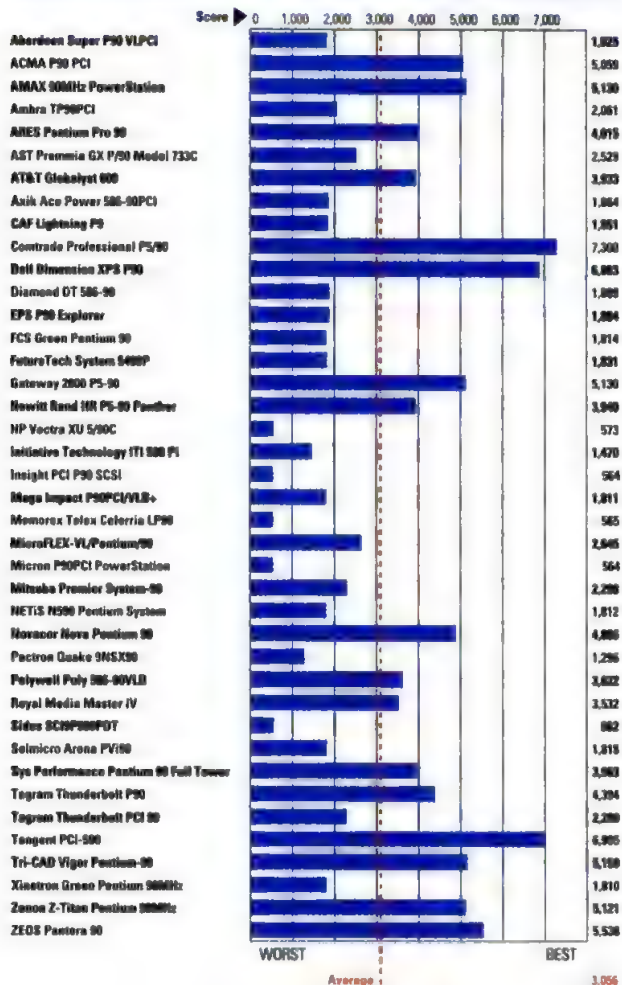
unprecedented DOSmark score of 1,429, surpassing its previous record of 1,386 (in our issue of June 28, 1994). Fueled by a third-place DOS video score and a fifth-place DOS disk score, the Dell Dimension proved a powerhouse DOS performer. Just behind it were the Tangent PCI-590 and the Comtrade Professional. The lowest DOSmark scores were less than half the leaders' scores.

Top processor scores went to the systems using Intel's Neptune chip set. Five of the top six performers used a 512K L2 cache; the exception—the AST Premmia GX P/90 Model 733C—compensated for its smaller 256K cache with extremely fast 8.5-ns synchronous SRAM.

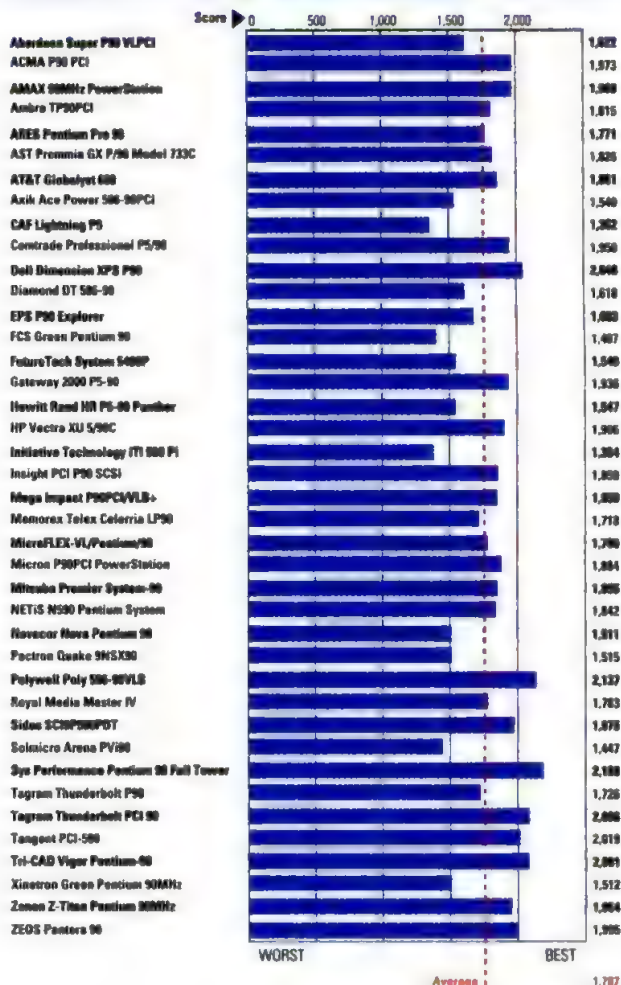
The first-place finisher on our processor tests, the HP Vectra, was helped by its 512K of 10-ns synchronous SRAM and unusually fast 3-1-1-1 burst-read timing.

On our DOS video tests, the systems with accelerators from Tseng Laboratories—traditionally the best performers—were displaced by units with S3 Vision 964 chips. The Comtrade Professional, with its S3 Vision 964-based Diamond Stealth Pro 64 card and 4MB of VRAM, posted an astounding DOS video score of 7,300. That's nearly 50 per-

DOS VIDEO



DOS DISK



cent faster than the highest-scoring systems with Tseng-based video subsystems. The worst performers were, as usual, systems based on Matrox video cards, which focus their resources on Windows rather than DOS acceleration.

The best performers on our DOS disk tests used IDE disks. The highest score was turned in by the Sys Performance Pentium, whose 8MB caching controller helped it achieve a score of 2,188.—*Analysis written by Richard Fisco*

How We Tested

For this issue, we used the application-based Winstone 94, Version 1.0, to determine overall system performance under Microsoft Windows 3.1, and we used WinBench 4.0 to obtain Graphics and Disk WinMark scores. We used PC Bench 8.0 to test processor, video subsystem, and disk performance using DOS applications. The DOSmark is a summary of those three results and estimates system performance under DOS.

Winstone 94, Version 1.0, measures the time a PC takes to execute a set of application scripts that exercise 12 Microsoft Windows 3.1 applications. We normalize Winstone scores relative to a 386DX/25 Compaq Deskpro/M with 4MB of RAM, which has a Winstone score of 10. The Winstone scores let you compare overall system performance under Windows.

The **Graphics WinMark** score is a measure of PC graphics performance under Windows 3.1. We run 66 different tests to evaluate each system's handling of the Windows GDI (Graphics Device Interface). These tests are based on extensive application profiling.

The **Disk WinMark** score reflects disk subsystem performance under Windows. The tests use different files and file operations in a blend based on extensive profiling of applications' disk usage.

The **DOSmark** score is a composite rating derived from the processor, DOS video, and DOS disk scores. It indicates a PC's ability to run DOS applications quickly and efficiently.

The **processor** score reflects CPU, RAM, and RAM cache performance. It is based on a large instruction mix and either the floating-point coprocessor test or the floating-point emulation test, depending on whether the PC has a coprocessor.

The **DOS video** score is a weighted harmonic mean of tests that measure 8- and 16-bit VGA write operations involving both text and graphics.

The **DOS disk** score gauges the performance of a PC's disk subsystem, which includes the hard disk, disk controller, and any hardware or software disk caches. Our tests use more than 100 files in six directories totaling over 30MB. The operations performed include file reads, file writes, file creation, and file deletion.

helped the Ambra TP90PCI get a Disk WinMark score that landed in the top ten.

The Ambra TP90PCI posted a solid Winstone score and an above-average Disk WinMark score. But the unit—equipped with a Weitek P9000—powered 32-bit Diamond Viper PCI-based video card with 2MB of VRAM—produced one of the lowest Graphics WinMark scores of the entire group, outgunned by other systems using 64-bit graphics cards.

The Ambra TP90PCI garnered processor and DOS disk scores that were average; its DOS video score was below average. The system achieved an average DOSmark score.—WPF

ARES Microdevelopment Inc.

• ARES Pentium Pro 90

The \$3,295 ARES Pentium Pro 90 gives you performance you would expect from a 90-MHz Pentium processor supported by a well-selected group of components. The system also offers the expansion capability inherent to a full-size tower case and comes with an outstanding support plan.

Internally, the ARES Pentium Pro is meticulously laid out. Cables are tied up and routed directly to the Intel motherboard and the ISA-based CD-ROM controller card. All four SIMM banks are

accessible, and the system's three PCI slots are laid out in line with the processor so that all five of the ISA slots can accommodate full-length cards.

In the configuration we looked at, ARES Microdevelopment connected a 540MB Western Digital hard disk to the integrated controller on the Intel motherboard. A PCI slot held a Number Nine graphics card using an S3 Vision 964 chip set.

The ARES Pentium Pro posted roughly average numbers on our benchmark tests. The system posted a slightly below-average Winstone score and average Graphics WinMark and Disk WinMark scores.

On our DOS disk tests, the ARES Pentium Pro 90 was an average performer. But its above-average showing on our DOS video tests and average marks on our processor tests combined to produce an above-average DOSmark score.

In summary, the ARES Pentium Pro is a well-built, neatly designed system worthy of a potential buyer's consideration. And it comes with an added bonus: ARES's exceptional system warranty, which covers parts for three years and labor for the system's lifetime. The warranty also includes one year of on-site service. Moreover, the company offers remote diagnostics and a forum on America Online.—WPF

AST Research Inc.

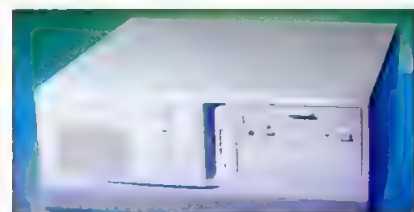
• AST Premmia GX P/90 Model 733C

A quick glance at the inside of AST Research's \$5,750 AST Premmia GX P/90 Model 733C and run-of-the-mill clone PCs begin to look bland by comparison. The AST Premmia's integrated Ethernet networking and aggressive service and support policies are appealing. The system as we tested it came with a 17-inch monitor (a \$900 option) and a larger-than-average 730MB hard disk.

The AST Premmia GX P/90 Model 733C is the latest addition to AST's top-level Premmia line. AST also offers the consumer-oriented Advantage line and the value-priced Bravo line, which is aimed at small and medium-size businesses.

The AST Premmia's motherboard has a Multiprocessor Specification 1.1-compliant socket for a second Pentium CPU, as well as integrated SCSI-2 and I/O connectors. It also includes a built-in

Ethernet port. The two PCI and five EISA expansion slots sit on either side of a vertical riser card, and the power supply and five drive bays—two of which housed a 730MB Quantum SCSI-2 hard disk and a Toshiba double-speed CD-ROM drive—are stacked to one side, leaving two PCI slots and three EISA slots available for full-size cards.



► FACT FILE

AST Premmia GX P/90 Model 733C

List price: \$5,750 (estimated). **Processor/Memory:** Pentium/90, 16MB RAM, 256K external cache. **Data storage:** Quantum 730MB SCSI-2 hard disk, integrated PCI disk controller, Toshiba XM-3401 TA CD-ROM drive.

Display: ATI Graphics ProTurbo 64 PCI video controller card with 2MB VRAM, AST Vision 7L 17-inch monitor with a 60-Hz refresh rate at 1,280-by-1,024. **Software:** DOS 6.21, Microsoft Windows 3.1.

AST Research Inc.: 800-876-4278, 714-727-4141.
450 on reader service card

SUITABILITY TO TASK

Windows applications **GOOD**

DOS applications **GOOD**

Expandability **GOOD**

VENDOR SERVICE & RELIABILITY

Reliability **AVERAGE**

Repair service **AVERAGE**

Technical support **AVERAGE**

The unit was not a top performer on our tests. It yielded average scores on our Winstone and DOS disk tests and an average DOSmark score as well. Its Disk WinMark score was well below average, and its DOS video score also fell below average. The system did manage a top-ten Graphics WinMark score and the second-highest processor score here.

AST offers a three-year parts-and-labor warranty, with one year of free on-site service. Technical support is available 24 hours a day, 7 days a week.—Robert S. Anthony

AT&T Global Information Solutions

• AT&T Globalyst 600

The AT&T Globalyst 600 offers above-average graphics performance and solid

► FACT FILE

ARES Pentium Pro 90

List price: \$3,295. **Processor/Memory:** Pentium/90, 16MB RAM, 256K external cache. **Data storage:** Western Digital 540MB IDE hard disk, integrated PCI disk controller, Mitsumi CRMC-FX001D CD-ROM drive. **Display:** Number Nine #9GXE 64 PCI video controller card with 2MB DRAM, CTX CMS-1562 GM 15-inch monitor with a 75-Hz refresh rate at 1,024-by-768. **Software:** DOS 6.21, Microsoft Windows for Workgroups 3.11, America Online start-up kit, QA Plus.

ARES Microdevelopment Inc.: 800-322-3200, 810-473-0808; fax, 810-473-4450.

450 on reader service card



SUITABILITY TO TASK

Windows applications **GOOD**

DOS applications **EXCELLENT**

Expandability **GOOD**

After Studying all the Angles...





There's Only One Winning Shot- The **ZEOS**[®] Pantera[™]



"...combines
quality features,
good price,
and high
performance...."
PC Magazine
Editors' Choice



"...was the
obvious choice
among the group...
our best bet."
Computer Shopper
No.1 Choice



"...rose above
the crowd and
posted the
most impressive
performance numbers."
Windows Sources
Experts' Pick

"...is a deal you
simply can't pass up."
PC/Computing
BEST



"...Pentium-90
is the fastest
system we've
tested...This is as
good as it gets."
PC World Best Buy

Processors	Package 1	Package 2	Package 3	Package 4
486SX-33	\$1495 Lease \$64/mo.	\$1795 Lease \$66/mo.	\$2295 Lease \$84/mo.	\$2845 Lease \$104/mo.
486DX-33	\$1645 Lease \$60/mo.	\$1945 Lease \$71/mo.	\$2445 Lease \$87/mo.	\$2995 Lease \$110/mo.
486DX2-50	\$1645 Lease \$60/mo.	\$1945 Lease \$71/mo.	\$2445 Lease \$87/mo.	\$2995 Lease \$110/mo.
486DX2-66	\$1695 Lease \$62/mo.	\$1995 Lease \$73/mo.	\$2495 Lease \$91/mo.	\$3045 Lease \$101/mo.
Pentium-60	\$1995 Lease \$73/mo.	\$2295 Lease \$84/mo.	\$2795 Lease \$102/mo.	\$3345 Lease \$111/mo.
Pentium-66	\$2095 Lease \$77/mo.	\$2395 Lease \$88/mo.	\$2895 Lease \$106/mo.	\$3445 Lease \$115/mo.
Pentium-90	\$2295 Lease \$84/mo.	\$2595 Lease \$95/mo.	\$3095 Lease \$103/mo.	\$3645 Lease \$121/mo.
Standard With Every ZEOS Panthera System: ➤ Genuine Intel Processor, ZIF socket for easy upgrading. ➤ PCI local bus color graphics card upgradable to 2MB. ➤ Two high-speed serial ports and one enhanced parallel port on the motherboard. ➤ Three PCI & 5 ISA slots. ➤ Socket for optional on-board Fast SCSI-2. ➤ Flash BIOS. ➤ 200 watt power supply with built-in surge suppressor. Switchable between 115/230V. ➤ ZEOS 101-key space-saving keyboard. ➤ FCC Certified Class B; UL Listed. ➤ ZEOS Customer Satisfaction Package.	➤ 4MB RAM ➤ 214MB local bus IDE hard drive with 32K cache ➤ 3.5" 1.44MB floppy disk drive ➤ 64-bit Windows-accelerated PCI local bus SVGA color graphics card with 1MB RAM ➤ ZEOS 14" 1024 x 768 non-interlaced SVGA color monitor, .28mm dot pitch ➤ Six-bay desktop case with two cooling fans ➤ MS-DOS 6.2, Windows for Workgroups 3.11, Microsoft Mouse	➤ 8MB RAM ➤ 528MB local bus IDE hard drive with 256K cache ➤ 2X CD-ROM drive, 3.5" 1.44MB FDD ➤ 64-bit Windows-accelerated PCI local bus SVGA color graphics card with 1MB RAM ➤ ZEOS 14" 1024 x 768 non-interlaced SVGA color monitor, .28mm dot pitch ➤ Six-bay desktop case with two cooling fans ➤ MS-DOS 6.2, Windows for Workgroups 3.11, Microsoft Mouse	➤ 16MB RAM ➤ 720MB local bus IDE hard drive with 128K cache ➤ 2X CD-ROM drive, 3.5" 1.44MB FDD ➤ 64-bit Windows-accelerated PCI local bus SVGA color graphics card with 1MB RAM ➤ ZEOS 15" 1024 x 768 non-interlaced SVGA color monitor, .28mm dot pitch ➤ Six-bay desktop case with two cooling fans ➤ MS-DOS 6.2, Windows for Workgroups 3.11, Microsoft Mouse ➤ Choice of Lotus Windows application	➤ 24MB RAM ➤ 1GB local bus IDE hard drive with 256K cache ➤ 2X CD-ROM drive, 3.5" 1.44MB FDD ➤ 64-bit Windows-accelerated PCI local bus SVGA color graphics card with 1MB RAM ➤ ZEOS 15" 1024 x 768 non-interlaced SVGA color monitor, .28mm dot pitch ➤ Six-bay desktop case with two cooling fans ➤ MS-DOS 6.2, Windows for Workgroups 3.11, Microsoft Mouse ➤ Choice of Lotus Windows application
	Pentium Extras: ➤ RAM expandable to 192MB. ➤ Business audio integrated on the motherboard.		486 Extras: ➤ RAM expandable to 128MB. ➤ EPA Energy Star compliant.	

More processors available. Call for details.

Favorite Options

528MB to 1GB Hard Drive Upgrade.....\$295

1MB to 2MB Video RAM Upgrade
For more colors and higher performance\$59

Diamond Stealth 64/PCI Video Card with 2MB VRAM
Fastest 64-bit accelerated video\$249

Upgrade from a 14" to a 15" Monitor
ZEOS SVGA NI, 1024 x 768, flat screen\$95

Upgrade from a 15" to a 17" Monitor
ZEOS SVGA NI, 1280 x 1024\$395

SCSI Controller Chip
For on-board SCSI. Includes drivers\$49

96/48/24 V.42 bis Send/Receive Fax Modem....\$49

Internal 14,400 bps V.32 bis Modem with 14,400 bps Send/Receive Fax Modem..\$129

ZNYX EtherAction 32
32-bit PCI Ethernet LAN adapter. 10Base5, 10Base2 and 10BaseT connections.....\$199

Internal Tape Backup
80 to 250MB (with compression), includes backup software\$159

10-Bay Vertical Case\$95

Multimedia Upgrade
Sound card and stereo speakers\$148

300W Power Supply Upgrade.....\$50

Lotus SmartSuite Upgrade
Five Windows applications (for Packages 3 & 4)\$299

Many other affordable upgrades and options available. Call for details!

Free Software

All packages include Microsoft DOS 6.2 and Windows for Workgroups 3.11. Packages 3 and 4 come with your choice of either Lotus Ami Pro, Freelance, 1-2-3, Improv, Organizer or Approach.

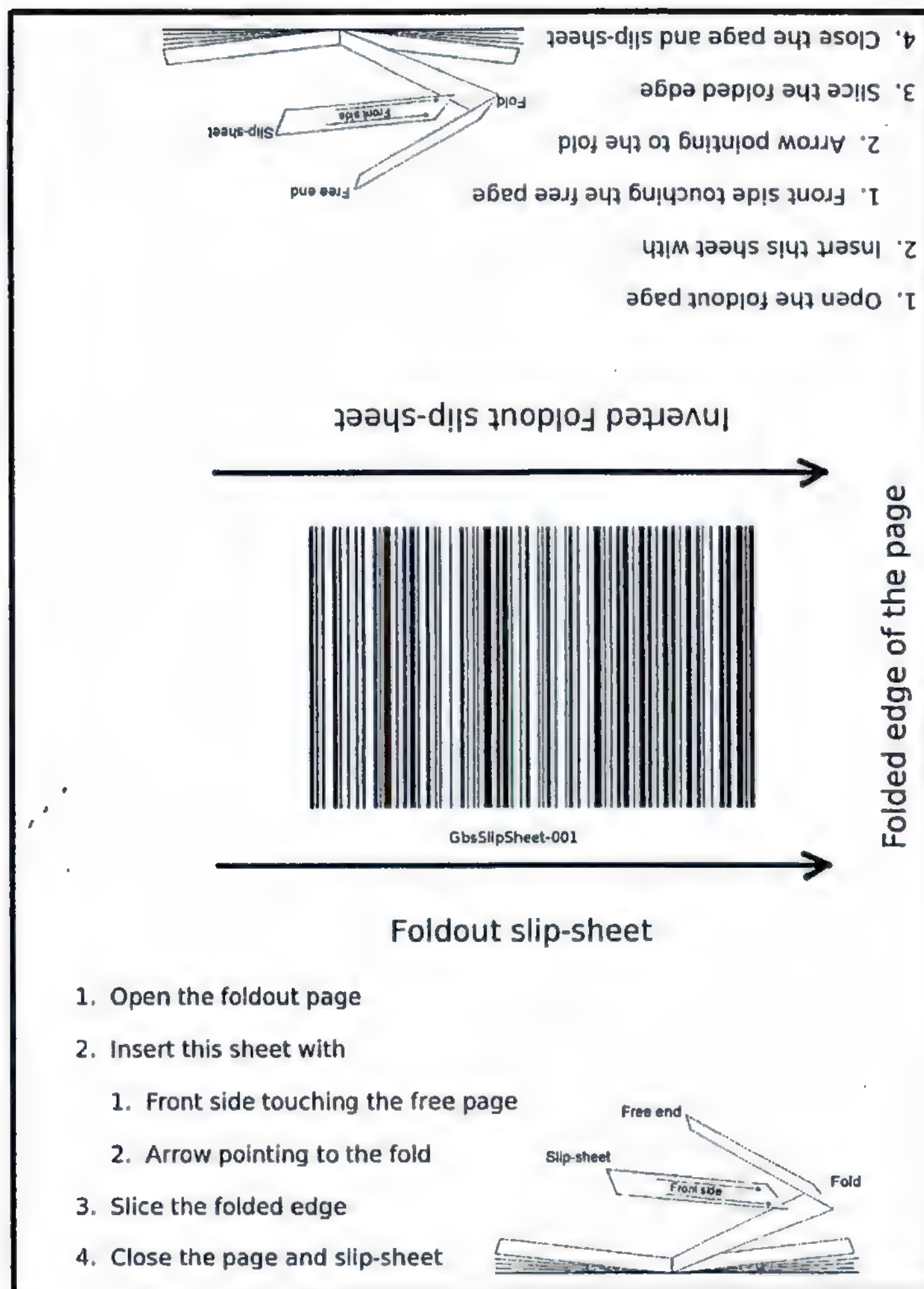


800-554-7172

**24 Hours a Day
365 Days a Year**

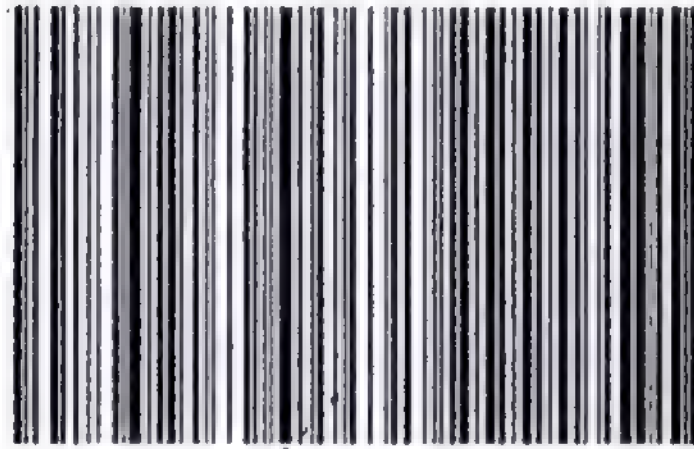


Fax Orders: 800-362-1205 or 612-362-1205. Phone Orders: Government: 800-245-2449, Outside U.S. and Canada: 612-362-1212.



1. Follow instructions on the other side

Inverted Back



Gbs5lip8ack-0018

Back

1. Follow instructions on the other side

We're Racking 'Em Up.



April 12, 1994
Pentium-66
June 28, 1994
DX4-100



April 1994
Pentium-60
August 1994
Pentium-90



January 1994
486DX2-66
February 1994
486DX2-66
March 1994
486DX2-66
June 1994
486DX2-66
June 1994
Pentium-66
July 1994
Pentium-66
August 1994
Pentium-66
August 1994
Pentium-90
September 1994
Pentium-66
September 1994
Pentium-90



May 1994
Pentium-66



June 1994
Pentium-66
August 1994
Pentium-90



March 1994
486DX2-66

ZEOS is on an award-winning streak... with no end in sight. Unmatched in its success, our Pantera line continues to rack up top industry awards—month after month.

Experts agree that the Pantera—based on Intel's Pentium, DX4 and 486 processors—is your sure shot.

Computer Shopper said: "ZEOS set the standard."

"The clear winner was the ZEOS Pantera. Its scores were the best across the board," reported *Windows Sources*.

PC/Computing concurred: "Rocket-fast performance and a great price make this our favorite Pentium of the lot."

Continuing with the ZEOS tradition of providing you with top performance, unwavering reliability and exceptional value, the ZEOS Pantera is unrivaled in its field.

Performance That's Unbeatable

The Pantera's supreme power and game-winning performance begins with a ZEOS designed motherboard, one that is created specifically to take full advantage of the latest technological

advancements. The motherboard is stocked with exceptional features such as an on-board PCI Local Bus IDE Controller supporting up to four IDE devices. For the fastest video performance, every Pantera comes with a new 64-bit PCI video card *standard*.

The results are unparalleled. The Pentium-66 and Pentium-90 PCs were "the fastest system(s)

ever tested" by *PC World*. "Mark a new high on the performance chart! They don't come any faster."

The ZEOS Pantera 66MHz and 90MHz also received the highest scores in all benchmark tests run by *Windows Sources*.

Every Angle Covered

From every angle, you'll come up a winner with the completely-compatible Pantera. It's the enduring champion. In addition to your choice of processors, you can choose from one of our many fully-loaded, money-saving packages (many ready to ship the same day you order) or you can custom-design a system to your exact computing needs. Either way, we've got you covered with affordable accessories, upgrades and peripherals.

What's more, you don't need a lot of green to be a winner. In fact, you'll have money left in your pocket! As *PC/Computing* said: "We suggest you spend your money on this machine—it offers the best value of any system we tested." You can buy with confidence because of our on-going commitment to provide you with high-quality features and state-of-the-art technology at an affordable price.

Even better, nobody does more to support you after the sale. ZEOS has won six *PC Magazine* Readers' Choice for Service & Reliability awards. No other company has won more. And we were the first to provide you with 24-hour toll-free technical support—every day.

Unmatched in performance, reliability, and value, the ZEOS Pantera "is the ultimate Power Desktop." As *PC World* said: "It's lightning fast, beautifully configured, and priced right. That's what power Best Buy is all about." To get your sure shot, call a ZEOS Systems Consultant now at 800-554-7172.



ZEOS Can Ship Today!

Our most popular packages can be shipped the day you call. Guaranteed!



486DX2-50 \$1945
486DX2-66 \$1995

Package #2:

- 8MB RAM
- 528MB local bus IDE hard drive, 256K cache
- 2X CD-ROM drive, 3.5" 1.44MB FDD
- PCI local bus SVGA video
- SVGA color monitor
- MS-DOS, Windows for Workgroups, Microsoft Mouse



486DX2-66 \$2445

Top Gun:

The above system modified to include:

- 256K SRAM cache
- Diamond Stealth 64/PCI local bus graphics with 2MB RAM
- 15" SVGA color monitor upgrade
- 14.4/14.4 send/receive fax modem
- Choice of Lotus Windows application



PC DX4-100 \$2845

Editors' 100:

- 16MB RAM, 256K SRAM cache
- 528MB local bus IDE hard drive, 256K cache
- 2X CD-ROM drive, 3.5" 1.44MB FDD
- Diamond Stealth 64/PCI local bus graphics with 2MB VRAM
- 14" SVGA color monitor
- MS-DOS, Windows for Workgroups, Microsoft Mouse
- Choice of Lotus Windows application



Pentium-66 \$2995
Pentium-90 \$3195

Editors' Choice:

The above system modified to include:

- 15" SVGA color monitor upgrade
- 10-bay vertical case



Pentium-66 \$3538
Pentium-90 \$3738

Best MM:

- 16MB RAM, 256K SRAM cache
- 528MB local bus IDE hard drive, 256K cache
- 2X CD-ROM drive, 3.5" 1.44MB FDD
- 16-bit sound card, stereo speakers
- Diamond Stealth 64/PCI local bus graphics with 2MB VRAM
- 17" SVGA color monitor
- 10-bay vertical case
- MS-DOS, Windows for Workgroups, Microsoft Mouse
- Choice of Lotus Windows application

Pentium-90 \$4495

Best MM Supreme:

The above system modified to include:

- 24MB RAM
- 1GB local bus IDE hard drive, 256K cache
- Altec Lansing high-power speakers

It's As Easy As:

1 Choose the ZEOS system package you want.

(A sampling of our *Computers Now!* packages is shown at left.)

2 For same-day shipping, call ZEOS at

800-554-7172 before 1 p.m. CDT, Monday-Friday.

3 Upon credit approval, we'll ship your system *the same day you order!*

Our Guarantee:

If we accept your order for immediate shipment and fail to ship your system under the conditions outlined, we will ship it *at our expense* as soon as it is ready.*

Need A Bigger Monitor?

We can upgrade your *Computers Now!* desktop or vertical system with a larger monitor—and still ship it the same day you order!*

800-554-7172

24 Hours a Day



Fax Orders: 800-362-1205 or 612-362-1205. Phone Orders: Outside U.S. and Canada: 612-362-1212, Government: 800-245-2449. ZEOS Information Systems, Inc. GS# GS00K94AGS5176. Purchase Orders, MasterCard, VISA, Am Ex, Discover, COD and affordable leasing programs. Open 24 Hours a Day, 365 Days a Year!



486SX-25 \$1195

Package #1:

- 4MB RAM, 128K SRAM cache
- 214MB hard drive, 32K cache
- 3.5" 1.44MB floppy drive
- VESA local bus SVGA color video
- SVGA color monitor
- MS-DOS, Windows for Workgroups, Microsoft Mouse



486SL-25 \$1544

Package #2 Plus:

- 4MB RAM
- 80MB IDE hard drive
- External 3.5" 1.44MB floppy drive
- Internal fax modem
- MS-DOS, Windows for Workgroups
- Lotus Organizer
- 9.7" x 6.1"; 3.9 lbs.



486SL-33 \$2195

Package #3:

- 8MB RAM
- 260MB IDE hard drive
- Internal 96/24 send/receive fax modem
- Custom carrying case
- Extra battery
- External charging stand
- MS-DOS, Windows for Workgroups
- 8.5" to 11.3" x 1.75" to 2.25"; 5.6 lbs.

*Orders must be for Computers Now! configurations; we're listed just a sampling here. Since we continuously update this list of configurations, please call to confirm your system is on the list. This offer is good only as long as these pre-built systems remain in stock. Other ZEOS systems and custom configurations may take slightly longer—about a week. All orders are subject to credit approval. Monitor upgrades available on all desktop Computers Now! packages. Orders must be received by 1 p.m. Central Time, 24/7.

Purchase orders are subject to approval. Business leasing programs available. Lease prices based on a 36-month lease; 10% purchase option. All prices, specifications and availability are subject to change without notice; call to confirm these and warranty details. Prices do not include shipping. Hewlett-Packability is a registered trademark of Hewlett-Packard Company. Intel Inside and Pentium Processor Logos are trademarks of Intel Corporation. ZEOS and Contenda are registered trademarks; Computers Now! is a registered service mark. Pantera is a trademark of ZEOS International Ltd. ©1994 ZEOS International Ltd. 1901 Industrial Blvd., Minneapolis, MN 55413 USA. ZEOS is a publicly traded company (NASDAQ symbol: ZEOS).

CIRCLE 155 ON READER SERVICE CARD.

► FACT FILE

AT&T Globalyst 600

List price: \$4,802.

Processor/Memory:

Pentium/90, 16MB RAM, 256K external cache. **Data storage:** Western Digital 540MB IDE hard disk, integrated disk controller, Sony CDU-561 CD-ROM drive. **Display:** ATI Mach 64 integrated PCI video controller with 2MB VRAM, Capetronic 008 0076561 15-inch monitor with a 75-Hz refresh rate at 1,024-by-768.

Software: DOS 6.2, Microsoft Windows for Workgroups 3.11.

AT&T Global Information Solutions; 800-225-5627, 513-445-5000.
452 on reader service card



SUITABILITY TO TASK

Windows applications **EXCELLENT**DOS applications **EXCELLENT**Expandability **FAIR**

VENDOR SERVICE & RELIABILITY

Reliability **BELOW AVERAGE**Repair service **BELOW AVERAGE**Technical support **BELOW AVERAGE**

average DOS disk score. The processor score was average, and the DOSmark showing was above average.

The AT&T Globalyst is a relatively expensive but well-built system that offers brand-name familiarity and is backed by a three-year standard warranty. On-site service is included for the first year.—WPF

Axik Computer Inc.

● Axik Ace Power 586-90PCI

The design of the \$4,498 Axik Ace Power 586-90PCI offers plenty of expandability and lets you add both VL-Bus and PCI peripherals. The price, however, is higher than it should be given the system's unexceptional components and poor performance.

This monstrous tower system offers enough expansion room for any type of use. There are no fewer than nine drive bays—five of them externally accessible. On top of five ISA slots, the motherboard offers two VL-Bus slots and four PCI slots. One of the PCI slots shares motherboard real estate with a VL-Bus slot. In the unit we saw, the two VL-Bus slots remained open, while two of the PCI slots were used by an Adaptec SCSI-2 hard disk controller and the video adapter.

On our benchmark tests, the Axik Ace

Power posted below-average numbers across the board. Scores on our Windows-based tests were decidedly unimpressive. The system's Winstone score was among the worst of the group, as was its Graphics WinMark score—despite the Diamond Stealth Pro 64 graphics card. The 525MB Quantum ProDrive SCSI-2 hard disk contributed to a Disk WinMark score that was also well below average.

On our DOS-based tests, the Axik Ace Power did not fare any better. The system's below-average DOSmark showing can be attributed to its last-place score on our processor tests, its low DOS disk score, and its very low DOS video score.

The Axik Ace Power can't compete in terms of performance or price; only its extensive expandability sets it apart from the pack.—WPF

CAF Technology Inc.

● CAF Lightning P9

CAF Technology's first entry into the Pentium market is its 90-MHz CAF Lightning P9. At only \$2,850, the CAF Lightning P9 may seem like a relatively inexpensive way to get a Pentium-powered system on your desk. But the reality isn't quite as inviting: The CAF Lightning P9 was minimally outfitted and finished at or near the bottom of the pack on every one of our benchmark tests.

The CAF Lightning P9 is housed in a standard desktop case. The unit's Aquarius Systems motherboard, driven by an OPTi chip set, has plenty of expansion slots: four ISA (two with VL-Bus extensions), three PCI, and one shared ISA/PCI slot. Even with all of these slots, however, expansion is limited by the CAF Lightning's setup and lack of integration. In our test configuration, one ISA slot was being used by an I/O/floppy disk drive controller, while another ISA slot was blocked by the cables leading from this card to the unit's serial and parallel ports.

On our benchmark tests, the CAF Lightning was a poor performer across the board. On our processor tests, the system finished second to last, barely edging out the Axik Ace Power 586-90PCI. And on our DOS disk tests, the unit—with its 343MB Quantum SCSI-2 disk drive—finished dead last. Its DOS video score received a slight boost from the S3-pow-

► FACT FILE

Axik Ace Power 586-90PCI

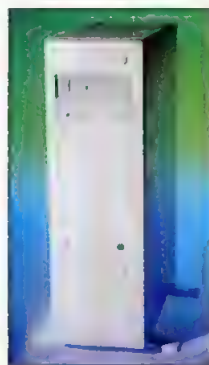
List price: \$4,498.

Processor/Memory:

Pentium/90, 16MB RAM, 512K external cache. **Data storage:** Quantum 525MB SCSI-2 hard disk, Adaptec PCI Master PCI disk controller card, NEC CDR-510 CD-ROM drive. **Display:** Diamond Stealth Pro 64 PCI video controller card with 2MB VRAM, ADI MicroScan 4GP 15-inch monitor with a 72-Hz refresh rate at 1,024-by-768. **Software:** DOS 6.21, Microsoft Windows for Workgroups 3.11.

Axik Computer Inc.; 800-234-2945, 408-735-1234; fax, 408-735-1437.

453 on reader service card



SUITABILITY TO TASK

Windows applications **GOOD**DOS applications **GOOD**Expandability **EXCELLENT**

performance overall, but its \$4,802 price tag is high relative to the price of other systems with similar components. AT&T sold PCs under the NCR name for a time but has consolidated all its products under the AT&T name.

This desktop system has an internal design much like that of a typical slimline unit, with expansion cards coming off a riser board. Surprisingly, however, this riser board has eight expansion slots on it—including two PCI slots. An ATI Mach 64 video chip is integrated onto the motherboard, leaving both PCI slots available. In the unit we saw, there was a SCSI adapter installed in one of the system's six ISA slots, but the other five were available. Two drive bays are also available on this system.

The AT&T Globalyst did well on our benchmark tests. It fared respectably on our Winstone test, posting a slightly above-average score, and its Graphics WinMark showing was among the best of the group. The DOS-based video score was above average as well. The unit's disk subsystem, based on a 540MB Western Digital hard disk, helped the system post an above-average Disk WinMark and an

• Multiply Your Investment

By Nick Stam

If a Pentium/90 system can't satisfy your need for speed, the answer may be a multiprocessor Pentium system. Testing showed the potential performance boost ranges from significant to tremendous.

That's not to say that multiprocessor systems are right for every power user. Many operating systems, including DOS and Microsoft Windows (including Chicago, the forthcoming Windows 4.0), can't take advantage of multiple CPUs, so you must use an advanced operating system such as Microsoft Windows NT, OS/2 SMP, or Unix, which can. You also need applications designed to exploit multiple CPUs, and there are few such apps available today.

Multiprocessing (when more than one CPU is implemented and can run multiple tasks or programs concurrently on different CPUs) differs from **multitasking** (when individual programs are enabled to perform multiple tasks simultaneously on one or more CPUs) and **multiprogramming** (when an OS is permitted to run multiple programs simultaneously). Multitasking and multiprogramming can be performed even on single-CPU systems by **time-slicing** (when each program or task is run for an interval of time before control is passed to the next).

PERFORMANCE TESTING

We ran a limited set of tests under Windows NT 3.1 using two AST Premia GX P/90 Pentium/90 PCs—a single-CPU model and a dual-CPU model that were otherwise identically configured with 24MB of RAM and 256K of L2 cache. In the two-CPU model, the L2 cache was shared between both CPUs. Since Windows NT 3.1 is not Multiprocessor Specification 1.1-compliant, AST provided us with a customized version of the NT Hardware Abstraction Layer, which can exploit a second CPU.

We tested using a Windows NT-specific version of our Stanford test suite, which comprises a set of small, numerically oriented CPU-intensive applications. Because of their small size and limited functionality, these tests are not the best measures of CPU and memory subsystem performance, but they do illustrate how well Windows NT itself handles multiprocessing.

Results of our Sequential tests showed the single-CPU system to be slightly more efficient than the dual-CPU

system when executing a single application thread.

Once we scaled to two or more active threads, the benefits of the second CPU were apparent. At 16 concurrent threads, performance was doubled with the second CPU. We believe these results represent best-case improvements; real applications will undoubtedly not scale as well.

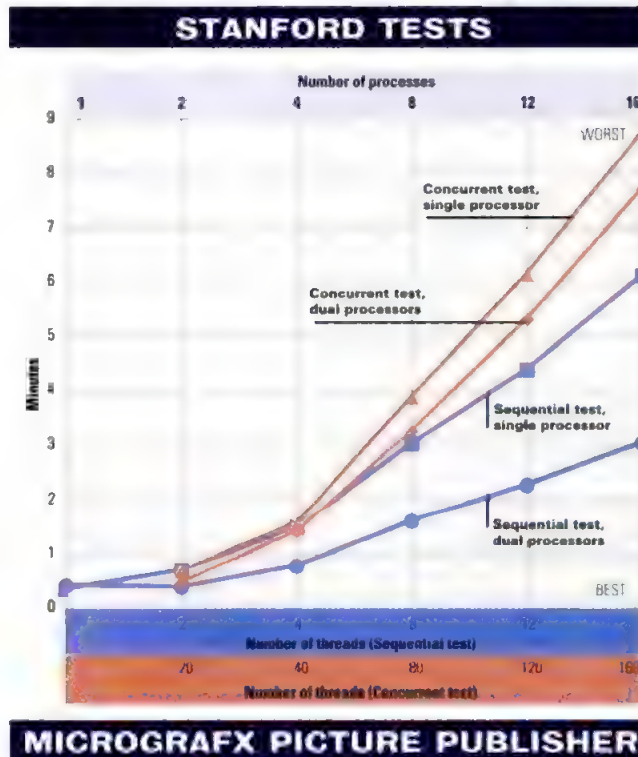
In running our Concurrent tests, we found that as the number of tasks became very large, the OS's overhead as it juggled the different processes diluted the second CPU's impact. Still, even at 160 threads the dual-CPU system outperformed the single-CPU unit by 14 percent.

We also tested using the Windows NT version of Micrografx Picture Publisher, focusing on the systems' abilities to carry out that package's Edge

Detection and Gaussian Blur functions. We observed performance improvements of about 60 to 70 percent with two CPUs.

IS MULTIPROCESSING FOR YOU?

Multiprocessing offers a relatively inexpensive way to boost the performance of processor-intensive applications and may be especially attractive to users of high-end CAD packages. But for most PC users today, it's not a viable solution. □





THE BEST VALUE IN CD-ROMS



- The best multimedia utilities for CD-ROM
- Improve CD-ROM access time with caching software
- Convert and modify photo CD images
- Play and listen to audio CDs: record and edit sound clips
- KOSS™ headphones included
- Also includes 100 royalty free photos and 150 sound clips

\$39.90*



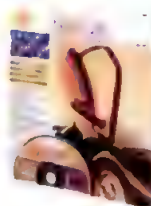
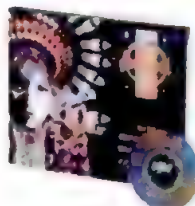
- Over 3,000 CorelDRAW images from the CorelDRAW \$1,000,000 World Design Contest
- Learn techniques from the pros and use these images in your desktop publishing projects
- Online MIDI music and a Windows screen saver module included
- ArtShow 2 and ArtShow 3 also available

\$29.90*

Enter the Corel \$2,000,000 World Design Contest and win! (September to March) To receive a faxed copy of the contest rules and an entry form please call: 1-813-728-0826 ext. 3980, Document #1084.

To leave a message please call: 1-813-728-0826 ext. 1600.

CIRCLE 020 ON READER SERVICE CARD



- 10,000 "drag and drop" or "cut and paste" clipart images (6,000 in color)
- Includes an easy-to-use Visual Clipart Manager
- Unlimited uses—brochures, newsletters, presentations, reports, invitations, memos, ads, and more
- Windows and Macintosh versions available

\$49.90*



- 100 razor-sharp photographs in the Kodak Photo CD format
- Royalty free and ready for color separation
- Can be converted to a variety of file formats
- Screen saver utilities included
- Hundreds of categories to choose from—and more each month
- PC and Mac compatible

\$19.95*

*U.S. funds plus applicable taxes

TigerDirect

1-800-CD-TIGER 1-800-238-4437

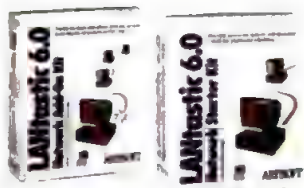
Please mention code BLY



For what you'll save on our LANtastic network kits, there's reason to celebrate

Save up to 24% on LANtastic Network Starter and Add-On Kits

That's right. Now you can network your PCs at the lowest price ever on the best peer-to-peer networking kit. You'll get an integrated kit of the award-winning LANtastic® v6.0 software, NodeRunner/SI™ cards and cable for two PCs, all in one box at \$110 off the top. It's a total solution with an MSRP of just \$349. Got more than two PCs? Good, you'll save even more: Add-on kits are now \$40 off. Get to your LANtastic dealer, get connected the easy way, and hey, get out and enjoy the fruits of your labor. Call 1-800-809-1245 for the Artisoft Premier™ or Artisoft Advantage™ Partner nearest you.

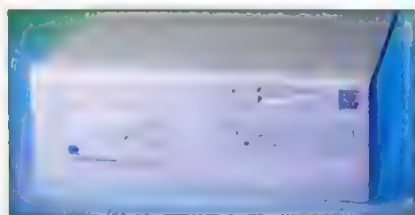


ARTISOFT®

ered Intel video card (which had only 1MB of video RAM), but this was not enough to resurrect its below-average DOSmark score.

Windows performance was similarly lackluster: The system finished in last place on our Graphics WinMark and Winstone tests, and it tied for last on our Disk WinMark tests.

The CAF Lightning is attractively priced, but its limited expansion possibilities and bottom-rung performance make it a system suitable for only the most cost-conscious buyer. The system comes with a one-year parts-and-labor warranty.—Carol Venezia



FACT FILE

CAF Lightning P9

List price: \$2,850. **Processor/Memory:** Pentium/90, 16MB RAM, 256K external cache. **Data storage:** Quantum 343MB SCSI-2 hard disk, Aquarius/CAF PCI disk controller card, Panasonic CR-562-B CD-ROM drive. **Display:** Intel V7-Mercury Lite PCI video controller card with 1MB VRAM, Sceptre CC-615G 15-inch monitor with a 72-Hz refresh rate at 1,024-by-768. **Software:** DOS 6.2, Microsoft

Windows 3.1.

CAF Technology Inc.;
818-369-3690; fax,
818-369-3692

454 on reader service card

SUITABILITY TO TASK	
Windows applications	FAIR
DOS applications	FAIR
Expandability	FAIR

Comtrade

Comtrade Professional P5/90

Comtrade's entry in our 90-MHz Pentium roundup is the Comtrade Professional P5/90, a mini-tower system with reasonable expansion potential and some nice extras, including a 17-inch CTX monitor. Its performance on our benchmark tests was exceptional. At \$3,695, it's also a good value.

The Comtrade Professional uses Intel's Plato motherboard—with the Neptune chip set—which fully integrates all I/O, floppy disk, and hard disk con-

FACT FILE

Comtrade Professional P5/90

List price: \$3,695.

Processor/Memory:

Pentium/90, 16MB RAM, 256K external

cache. **Data storage:**

Conner 540MB IDE hard disk, integrated PCI disk

controller, Mitsumi CRMC-FX001D CD-ROM

drive. **Display:**

Diamond Stealth Pro 64 PCI video controller card

with 4MB VRAM, CTX CMS-1765 17-inch

monitor with a 72-Hz refresh rate at 1,024-by-768.

Software: DOS 6.21,

Microsoft Windows for Workgroups 3.11.

Comtrade; 800-969-

2123, 818-961-6688;

fax, 818-369-1479.

455 on reader service card



SUITABILITY TO TASK	
Windows applications	EXCELLENT
DOS applications	EXCELLENT
Expandability	FAIR

trollers. There are also four SIMM banks, although the two in use are blocked by the drive bay assembly. The Comtrade Professional also offers four ISA slots, two PCI slots, and one ISA/PCI slot that share the same backplate. But two of the ISA slots in the unit we saw were blocked by cables running from the motherboard to the unit's I/O ports; this left a PCI, an ISA, and the shared slot still free. The system's roomy tower case also contains seven drive bays; only three were occupied in the test configuration.

Historically, few systems have been able to perform equally well on both DOS- and Windows-based video benchmark tests. The Comtrade Professional, however—powered by an S3-based Diamond Stealth Pro 64 video card with 4MB of VRAM—managed to take first place on both our DOS video and Graphics WinMark tests.

On the remainder of our tests, the Comtrade Professional was a strong performer. Its processor score was average, and its DOS disk score was above average, contributing (along with the astronomical DOS video score) to the unit's third-place DOSmark showing. On our Winstone and Disk WinMark tests, the unit showed above-average performance as well.

The Comtrade Professional is an easy system to recommend.—CV

Dell Computer Corp.

Dell Dimension XPS P90

The \$3,749 Dell Dimension XPS P90 is another in a long line of well-priced systems from Dell Computer Corp. This 90-MHz Pentium system offers plenty of hardware for the price, although it was not a star performer in this pack of high-powered machines. Dell aims its Dimension line at small businesses or individual users, while its other lines—the OptiPlex and OmniPlex lines—are intended mostly for corporations and include more network and security features.

For starters, the Dell Dimension came to us with a more than ample 1GB Conner IDE hard disk, a dual-media floppy disk drive, a Creative Labs Sound Blaster 16 sound board, a Panasonic CD-ROM drive, and two speakers. The uncluttered desktop-case interior offers easy access to the motherboard, which features integrated I/O ports and easy access to the system's five drive bays. Of the unit's three PCI expansion slots, one was filled with a Number Nine #9GXE 64 video card; of the five ISA expansion slots, one was



FACT FILE

Dell Dimension XPS P90

List price: \$3,749. **Processor/Memory:**

Pentium/90, 16MB RAM, 256K external cache. **Data**

storage: Conner 1GB IDE hard disk, integrated PCI disk controller, Panasonic CR-563 CD-ROM drive. **Dis-**

play: Number Nine #9GXE Pro 64 PCI video card with 2MB VRAM, Dell UltraScan VS 15 15-inch monitor

with a 72-Hz refresh rate at 1,024-by-768.

Sound card: Creat-

ive Labs Sound

Blaster 16. **Soft-**

ware: DOS 6.21,

Microsoft Windows

for Workgroups 3.11.

Dell Computer Corp.;

800-289-3355, 512-

338-4400; fax, 800-

727-8320.

456 on reader service card

SUITABILITY TO TASK	
Windows applications	GOOD
DOS applications	EXCELLENT
Expandability	FAIR
VENDOR SERVICE & RELIABILITY	
Reliability	ABOVE AVERAGE
Repair service	ABOVE AVERAGE
Technical support	ABOVE AVERAGE

When you travel light.

IBM PC
Direct



IBM®

you'll go farther.

**Introducing the new
ThinkPad® 510Cs. The new
standard in subnotebooks.**

A lighter notebook shouldn't mean a lesser notebook. At the heart of every ThinkPad 510Cs beats a powerful Blue Lightning™ 486 processor with clock-doubled 50/25MHz clockspeed. That's power to spare for running today's graphics-driven applications, from spreadsheets to project and presentation management.



**ThinkPad 510Cs
Color subnotebook**

\$2399

IBM Credit Lease
\$89/month¹

The new ThinkPad 510Cs

- 486BL2-50 Blue Lightning 50/25 MHz processor
- 16KB 4-way associative on-chip cache
- 4MB RAM (expandable to 20MB)
- 200MB² hard drive
- Features a 7.7" (measured diagonally) VGA color LCD screen
- Weighs just 4 lbs.
- Local bus video
- One Type I or Type II PCMCIA slot
- External 3.5" 1.44MB diskette drive
- 81-Key Keyboard with integrated TrackPoint II™
- Hundreds of dollars worth of preloaded business software
- Runs up to 8 hours on one battery charge
- Rechargeable NiMH battery and AC adapter (30w)
- 1-year International Traveler's Warranty⁴

**ThinkPad 360Cs
Color notebook**

\$2599

IBM Credit Lease
\$97/month¹

For more value

- Intel 486SX/33MHz processor
- 8KB internal cache
- 4MB RAM (expandable to 20MB)
- 170MB HD (upgradable to 810MB)
- 9.5" (measured diagonally) dual scan VGA 256-color display
- Weighs just 6.2 lbs.
- One Type III or two Type II or Type I PCMCIA slots
- 3.5" 1.44MB diskette drive
- 85-Key Keyboard with integrated TrackPoint II plus function keys for power management and battery status
- Hundreds of dollars worth of preloaded business software
- Runs up to 7 hours on one battery charge
- Rechargeable NiMH battery and AC adapter (30w)
- 1-year International Traveler's Warranty⁴

**Not as light
as a frisbee. But it's
close.** The ThinkPad 510Cs weighs just 4 pounds. Its stylish design fits comfortably in your briefcase or pocketbook. Yet it delivers crisp, intelligent color.

**With the
ThinkPad 360Cs,⁵
satisfaction starts
with the right
performance, at
the right price.** The IBM ThinkPad received the coveted J.D. Power and Associates Award for "Highest in Customer Satisfaction among

Portable Computer Business Users." Now the ThinkPad 360Cs draws inspiration from that legacy with an impressive and intelligent blend of sophisticated performance, offered at an affordable price. We're adding even more practical value to the ThinkPad 360Cs with hundreds of dollars of preloaded communications and business software, including Lotus® cc: Mail™, Lotus Organizer™, SofNet FaxWorks™ and more.

**HelpWare service and support adds
built-in quality to every ThinkPad.** You'll like both our 1-year International Traveler's Warranty⁶ and ThinkPad EasyServ courier repair service (available only in the U.S.). It's good wherever you are, from your home, office or even hotel room. Of course, you also get HelpCenter® technical support 24 hours a day, 7 days a week.

**Give us a call. Every ThinkPad
has plenty of options to choose from.** From port replicators to docking stations, PCMCIA cards to plug-in color coordinated monitors, we can CustomerFit your ThinkPad to your precise needs. Ask your Sales Representative for details.



Call us, we're open 8am-10pm Monday-Friday
and 9am-5pm Saturday (Eastern Daylight Time)
In Canada call 1 800 465-7999

**IBM PC
Direct**

To order call today!

1 800 426-7659

The flexibility
to manage growth.

The ability
to help you create it.

IBM PC
Direct



IBM

Introducing the new IBM Performance Series.

Finding the right computer isn't easy. But when you look closely, you'll find that IBM's new ValuePoint™ Performance Series delivers a number of powerful differences.

We asked hundreds of businesses what they wanted. Performance tailored to today's more complex, more sophisticated graphics-driven applications. That's why our DX4/100MHz uses a clock-doubled 100/50 MHz chip—it delivers 15% more performance than more conventional 100/33MHz chips. We also engineered in cutting-edge 64-bit graphics — delivering double the graphics performance of conventional 32-bit systems.

A PC that changes as your needs change. If your PC is a tool to help your business grow, then growth shouldn't make your PC obsolete. With the IBM Performance Series, you can change and upgrade almost anything without having to buy a new system.



New 3-year warranty.³ Our superior service includes 1 year of onsite support anywhere in the U.S. During the second and third year, we cover both parts and labor, unlike some competitors who cover only parts. And every Performance Series system comes with HelpWare®. When you need to talk to us, we're always there, 24 hours a day, 7 days a week. Of course, there's a 30-day moneyback guarantee on everything we sell.⁴

Call us today. The perfect PC starts with CustomerFit. It isn't just a collection of technologies. It's a reflection of the way you work and the work you do. And it's always at a price you can afford.

Take a closer look. You'll see the IBM Performance Series difference.

ValuePoint® 433SX/5p	ValuePoint® 100DX4/0p
\$1989 IBM Credit Lease \$74/month ¹	\$3349 IBM Credit Lease \$125/month ¹
For more power:	For more power:
• Intel® 486SX/33MHz chip	• Intel 486DX4 chip with a 100/50 MHz clockspeed
• 4MB RAM (expandable to 128MB)	• 8MB RAM (expandable to 128MB)
For more flexibility:	• Math coprocessor
• Pentium™ chip upgradable ²	• 256K L2 cache
• Enhanced IDE 270MB ² HD	For more flexibility:
• VESA local bus	• Pentium chip upgradable ²
• SpaceSaver with 3 slots, 3 bays	• Enhanced IDE 728MB HD
• Plug and Play enabled	• Upgradable to 4 hard drives of up to 1GB each
	• VESA local bus upgradable to PCI (Selectabus)
	• Desktop with 5 slots, 5 bays
	• Plug and Play enabled
For better graphics: 1MB Video Memory (upgradable to 2MB) ■ 64-bit graphics performance ■ 14V Color Monitor with a maximum diagonal viewable screen size of 13"	
Also standard: IBM Enhanced 101-Key Keyboard and Mouse ■ Energy Star Compliant ¹¹ ■ 3-year warranty ³ ■ 30-day moneyback guarantee ■ DOS & Windows preloaded	



Call us, we're open 8am-10pm Monday-Friday and 9am-5pm Saturday (Eastern Daylight Time)
In Canada call 1 800 465-7999.

IBM PC
Direct

To order call today!

1 800 426-7659

CustomerFit also covers what you see. And what you get.

Wall-to-wall beautiful. Our advanced, high-resolution "V" series monitors deliver a brighter, bolder, crisper, flicker-free image. But best of all, they're borderless – your image extends all the way out to the very edge of the screen. So there's no wasted space. And when you're not using them, they'll automatically power down to miserly energy consumption levels.⁷ When you resume work, just touch a key or the mouse and they'll power up instantly, right where you left off. Cross-platform compatibility is built in, so you can plug it right into almost any IBM-compatible system and run most popular software. The 17V,⁸ 15V, and 14V monitors



have a maximum diagonal viewable screen size of 15.8, 13.7, and 13 inches, respectively.

17V.....\$999

15V.....\$579

14V.....\$429

Professional output, without the outlay. The value-priced IBM ExecJet® II 4076 has 600x300 dpi resolution and 12 scalable resident fonts, for professional-quality documents. And it's easy to live with, thanks to its quiet operation and a single-element replaceable print cartridge that snaps right in.



ExecJet II 4076 \$299

The look and speed of a laser. For under \$800. The IBM 4037 5E Page Printer raises the standard for small printers. Its 1500x300 dpi resolution (with our exclusive Print Quality Enhancement Technology) gives you the high-quality output you need for both text and business graphics. And you get 5 pages per minute speed, 16 scalable resident fonts, plus Lexmark™ reliability.



4037 5E Page Printer \$705

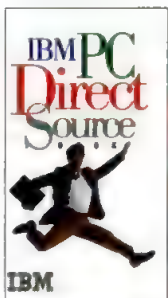
IBM PC Direct

Isn't it refreshing to talk to someone who actually listens? And who'll help you put together the system that's exactly right for you? Not more than you want. Or less than you'll need. You can count on IBM PC Direct™ to put together the perfect combination of hardware, software, peripherals and accessories. And you can pay the way you prefer. You can choose from most major credit cards, 36-month business leasing plans, or purchase orders for qualified customers.

IBM PC Direct prices and offerings are subject to change or withdrawal. Prices/offerings in Canada may vary. Reseller prices vary. Shipping and handling charges are extra. IBM Credit Lease prices are quoted for 36-month terms. Lease rates quoted are good through 9/30/94, after which time rates are subject to change without notice. Lease available to qualified commercial customers only. ⁷When referring to hard drive capacity, MB stands for 1,000,000 bytes. Total user-accessible capacity may vary slightly based on operating system environment. ⁸At no additional charge during warranty period. On-site service available Monday-Friday 8am-5pm in your time zone. Second and third year is customer carry-in service. Please ask your Sales Representative for details. ⁴Please call 1 800 426-7651 for details on IBM's money-back guarantee and limited warranties. Copies available upon request. ⁵Manufactured in Mexico. International Traveler's Warranty service is available to those customers traveling to countries where this product is sold by IBM or IBM Business Partners. Other restrictions apply. Please ask your Sales Representative for details. The energy saving circuitry is activated by the signal sent from the system units that support the VESA DPMs proposal. ⁶Manufactured in Taiwan. ¹Upgradable with Intel's DivX™ processor based on Pentium processor technology. ²EPA, as a matter of policy, does not endorse any particular company or its products. IBM ThinkPad, HelpCenter, HelpWare and ExecJet are registered trademarks, and ValuePoint and TrackPoint II are trademarks of International Business Machines Corporation. All other brands and product names are registered trademarks, trademarks or service marks of their respective holders. Windows is a trademark of Microsoft Corporation. Software programs listed are licensed to customers under non-IBM software vendor's terms and conditions provided with the package. IBM makes no representations or warranties regarding non-IBM software. 1993 J.D. Power and Associates Portable Computer Satisfaction Study. Study conducted among business users. PC Direct is a trademark of Ziff Communications Company and is used by IBM under license. ©1994 International Business Machines Corporation.

Want even more choices? Just call.

There's a whole lot more in the IBM PC Direct Source Book. You'll find our award-winning ValuePoints and ThinkPads, plus printers, monitors, hard drives, memory upgrades, multimedia, networking and software – 64 pages in all. And there's no charge. So order yours today.



Call us, we're open 8am-10pm Monday-Friday and 9am-5pm Saturday (Eastern Daylight Time)
In Canada, call 1 800 465-7999

IBM PC Direct

To order call today!

1 800 426-7659

filled with the sound card.

The Dell Dimension was a strong performer on most of our DOS-based benchmark tests but was only an average performer under Windows. The system posted an above-average Disk WinMark score but yielded only average Graphics WinMark and processor scores and a marginally below-average Winstone score. In contrast, the unit posted excellent DOS disk and DOS video scores, which helped it obtain the best DOSmark score of all the machines in this roundup.

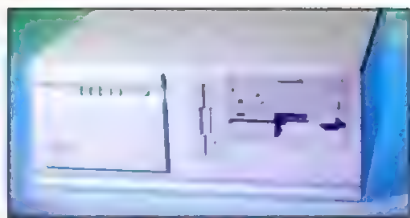
The Dell Dimension is a quality multimedia machine with more than sufficient processing power.—RSA

Diamond Technologies Inc.

• Diamond DT 586-90

The 90-MHz Diamond DT 586-90 from Diamond Technologies is moderately priced at \$3,659. And its warranty—three years for parts and labor and one year for the monitor, hard disk and CD-ROM drive—is extensive. The system's chief shortcoming is its decidedly lackluster performance.

Diamond equips this machine with Microsoft Windows 3.11 and an Energy Star-compliant 15-inch monitor. System power management options are available



► FACT FILE

Diamond DT 586-90

List price: \$3,659. **Processor/Memory:** Pentium/90, 16MB RAM, 512K external cache. **Data storage:** Maxtor 345MB SCSI-2 hard disk, Tekram DC-880 VL-Bus disk controller card with 2MB cache, Toshiba XM-3401B CD-ROM drive. **Display:** Diamond Stealth Pro 64 PCI video controller card with 2MB DRAM, Sceptre CC-615 15-inch monitor with an 87-Hz refresh rate at 1,024-by-768. **Software:** DOS 6.21, Microsoft Windows 3.11.

SUITABILITY TO TASK

Diamond Technologies Inc., 800-989-7253, 714-533-9310; fax, 714-533-7805.

457 on reader service card

Windows applications	FAIR
DOS applications	GOOD
Expandability	GOOD

► SUMMARY OF FEATURES

CONTINUES

90-MHz Pentium PCs

List price (tested configuration) We report the prices for the systems configured the way we tested them. Some vendors provide estimated selling prices to reflect more accurately what customers should expect to pay for their systems.

Hard disk capacity and interface describes the hard disk included in the tested system. All tested systems used either IDE or SCSI-2 as the interface between the hard disk and controller.

Dealers/Direct-distribution channel Some vendors sell only through authorized dealers or company-owned stores. Others sell their PCs directly to users via mail order or combine both methods.

Case style greatly affects a system's expansion potential. Keep in mind that a smaller, well-designed system may rival a larger but poorly arranged one.

Power supply (and number of connectors) We list the wattage of each power supply and the number of connectors for each. The number of connectors determines how many devices the PC can power.

DOS, Microsoft Windows version We asked all vendors to preinstall DOS and Microsoft Windows on their systems before shipping them to us. We list which versions of these packages each vendor included.

Warranty All vendors include at least a one-year parts-and-labor warranty with their systems.

Primary and secondary bus architecture refer to the buses that connect the I/O slots to the CPU.

Processor upgrade path Processors can be seated in several different types of sockets, which affect a computer's upgradability. These sockets are either *standard* or *ZIF* (zero insertion force). The latter type dominated this roundup of systems.

We indicate the **BIOS version (or date)** for each system. The BIOS, which performs a computer's initial boot and test routines and lets the operating system communicate with hardware, may

affect a unit's performance on our benchmark tests.

Flash BIOS stores the system's BIOS code, replacing conventional ROM storage for this purpose. Unlike ROM, flash BIOS can be electrically reprogrammed, making the BIOS upgradable.

External RAM cache We list the range of external RAM cache a computer can support. For systems that come with a set amount of RAM cache that is not upgradable, we report that amount.

Cache architecture In a *direct-mapped* cache, each address in main memory is assigned to one location in the cache. Each location in the cache, however, can accept data from many main memory addresses—though not from more than one at once. This one-to-many relationship between main memory and the cache often results in bottlenecks. *Two-way set-associative* caches relieve this problem somewhat by allowing each address in main memory to occupy one of two locations in the cache; the penalty is that the cache must be searched to determine in which of the two locations data is located. *Four-way set-associative* caches extend this concept to allow data from each main-memory address to occupy one of four locations in the cache.

Cache write design *Write-through* caches write updated data to both the cache and main memory. Although a write-through cache is relatively easy to implement, it can introduce delays when the processor must wait to complete writes to the slower main memory. For a *write-back* cache, data that has been changed is written back to the cache; main memory is updated only when the cached data is replaced, thus minimizing delays.

Disk controller location and display circuitry location In each case, the circuitry can be located either on an expansion card (VL-Bus or PCI) or on the motherboard. Circuitry residing on the motherboard may also use PCI technology.

CD-ROM drive We required CD-ROM drives on all of the tested systems. Here we indicate the manufacturer and model of each drive in our tested configuration.

► SUMMARY OF FEATURES

CONTINUES

90-MHz Pentium PCs

Products listed in alphabetical order

■ = YES □ = NO

	Aberdeen Super P90 VLPCI	ACMA P90 PCI	AMAX 90MHz PowerStation	Ambra TP90PCI	ARES Pentium Pro 90
List price (tested configuration)	\$3,295	\$3,495	\$3,895	\$3,899	\$3,295
Processor type and speed	Pentium/90	Pentium/90	Pentium/90	Pentium/90	Pentium/90
Hard disk capacity and interface	546MB IDE	514MB IDE	514MB IDE	731MB IDE	540MB IDE
Dealers/Direct-distribution channel	□ ■	■ ■	■ ■	□ ■	□ ■
Case style	Mini-tower	Tower	Tower	Mini-tower	Tower
Power supply (and number of connectors)	250W (6)	250W (8)	250W (6)	200W (6)	250W (5)
DOS, Microsoft Windows version	DOS 6.2, Windows for Workgroups 3.11	DOS 6.21, Windows for Workgroups 3.11	DOS 6.21, Windows for Workgroups 3.11	DOS 6.2, Windows 3.1	DOS 6.21, Windows for Workgroups 3.11
Warranty	2 years parts, lifetime labor	1 year	1 year	1 year	3 years parts, lifetime labor
On-site service charge	\$229.95 (4 years)	Included (1 year)	\$39.00 (1 year)	Included (1 year)	Included (1 year)
Processor and Memory					
Bus architecture (primary)	ISA	ISA	ISA	ISA	ISA
Bus architecture (secondary)	PCI and VL-Bus	PCI	PCI	PCI	PCI
Motherboard manufacturer	Super Micro	Intel	Intel	Intel	Intel
Chip set manufacturer	OPTi	Intel	Intel	Intel	Intel
Processor upgrade path	ZIF	ZIF	ZIF	ZIF	ZIF
BIOS version (or date)	AMI (12/15/93)	AMI (3/23/94)	AMI (3/23/94)	AMI 1.00.1 AX1D	AMI 1.00.03
Flash BIOS/16550 UART support	■ □	■ ■	■ ■	■ ■	■ ■
Installable system RAM	2MB-128MB	2MB-128MB	2MB-128MB	4MB-128MB	4MB-128MB
External RAM cache	128K-512K	256K	256K	256K	256K
Cache architecture	Two-way set-associative	Direct-mapped	Direct-mapped	Direct-mapped	Direct-mapped
Cache write design	Write-through	Write-back	Write-back	Write-back	Write-back
Components					
Available hard disk sizes	210MB-4GB	210MB-2GB	210MB-9GB	420MB-2GB	270MB-2GB
Disk controller location	VL-Bus card	Motherboard (PCI)	Motherboard (PCI)	Motherboard (PCI)	Motherboard (PCI)
Accessible drive bays (5.25", 3.5")	3, 0	6, 0	4, 0	3, 1	4, 0
Internal drive bays (5.25", 3.5")	0, 2	0, 4	1, 3	0, 2	2, 2
Floppy disk drives	1.44MB	1.44MB	1.44MB	1.44MB	1.44MB
CD-ROM drive	Sony CDU-33A-01	NEC CDR-610	Chiron CDS-535	Philips/LMS CDR 206	Mitsumi FX-001D
ISA, EISA, MCA slots	3, 0, 0	5, 0, 0	5, 0, 0	5, 0, 0	4, 0, 0
VL-Bus, PCI, proprietary local-bus slots	2, 4, 0	0, 3, 0	0, 3, 0	0, 3, 0	0, 3, 0
Parallel, serial, mouse ports	1, 2, 0	1, 2, 0	1, 2, 0	1, 2, 1	1, 2, 0
Display circuitry location	PCI card	PCI card	PCI card	PCI card	PCI card
Video chip set manufacturer	ATI	ATI	ATI	Wetitek	S3
Video RAM	2MB-4MB	2MB	2MB-4MB	2MB	2MB-4MB

through the unit's AMI BIOS; there are four settings available, along with programmable time intervals. Diamond also includes 512K of synchronous L2 processor cache and a double-speed CD-ROM drive. The inside of the system is neatly laid out and free of obstructions so you can take advantage of the two available drive bays. In the unit we saw, the expansion cards and memory were also configured to leave one ISA, one VL-Bus, and three PCI slots free.

The Diamond DT 586-90 employs a Diamond Stealth Pro 64 graphics board from Diamond Computer Systems. (There is no relation between the two companies.) The tested system came with a 345MB

Seagate SCSI-2 model driven by a Tekram caching controller card with 2MB of RAM.

On our benchmark tests, the Diamond DT 586-90 posted scores that were average to below average. The unit performed well below average on our Windows-based tests (its Winstone score placed seventh from the bottom), but it posted average scores for the most part on our DOS-based tests. Processor, DOS disk, and DOSmark scores were average, but the DOS video score was well below average.

The Diamond DT 586-90 isn't the right system if you demand top performance, but it is an aggressively supported and reasonably priced offering worth consideration.—*Mary E. Behr*

EPS Technologies Inc.

• EPS P90 Explorer

According to EPS Technologies, the \$4,445 EPS P90 Explorer is designed as both a high-end desktop machine and a server. The system's price includes some appealing extras: 32MB of RAM, 512K of processor cache, and a 17-inch monitor. But a less-than-optimal internal layout and average-to-below-average performance make the EPS Explorer limiting for the serious power user.

The system's motherboard provides both VL-Bus and PCI expansion slots, but the positioning of expansion boards limits the number of slots actually available. In the unit we saw, there was a dual fan card installed in one ISA slot; according to EPS, the card is provided as a safety measure to prevent possible overheating problems in fully loaded systems. EPS also says that the system works fine without the card—an option worth considering, since the card blocks one of the two VL-Bus slots.

Another ISA slot held an I/O controller card, which rendered the motherboard's shared ISA/PCI slot unusable because the ports ran out the back panel of the shared slot. That left only one VL-Bus slot and one PCI slot usable in the system we tested.



► FACT FILE

EPS P90 Explorer

List price: \$4,445. **Processor/Memory:** Pentium/90, 32MB RAM, 512K external cache. **Data storage:** Quantum 540MB SCSI-2 hard disk, EPS PCI disk controller card, Plextor DM-3028 CD-ROM drive. **Display:** Diamond Stealth Pro 64 PCI video controller card with 2MB VRAM, EPS EPS17AH 17-inch monitor with a 70-Hz refresh rate at 1,024-by-768. **Software:** DOS 6.2, Microsoft Windows 3.1.

SUITABILITY TO TASK

Windows applications	GOOD
DOS applications	GOOD
Expandability	FAIR

EPS Technologies Inc., 800-447-0921, 605-966-5586; fax, 605-966-5482

4GB on reader service card

90-MHz Pentium PCs

Processor and Winstone scores were both average. On our disk tests, the unit's 540MB Quantum SCSI-2 hard disk contributed to average results under DOS and a below-average showing under Windows. Graphics WinMark and DOS video scores were both well below average.

The EPS Explorer lets you take advantage of both VL-Bus and PCI peripherals, and its price is competitive given its extra RAM and large monitor. Its mediocre performance, however, prevents it from being a standout value.—WPF

First Computer Systems Inc.

• FCS Green Pentium 90

First Computer Systems' \$3,999 FCS Green Pentium 90 comes in a huge tower case that provides lots of room for expansion, with seven free drive bays. Unfortunately, performance was bottom of the barrel. And despite the "green" in the name and power-saving features in the system BIOS, we were unable to get the machine to power down to Energy Star-compliant levels.

FCS offers a line of Green Pentiums that is made up of 60-, 66-, 90-, and 100-MHz systems. We tested what FCS says is its most popular configuration, the 90-

MHz Pentium with 16MB RAM, a 541MB SCSI-2 hard disk, and a 15-inch monitor. This unit also included an NEC triple-speed CD-ROM drive.

For expansion, this unit offers both PCI and VL-Bus slots. But in the unit we saw, the back panel of one of the VL-Bus slots was blocked by cables and ports from the neighboring I/O controller card. On the other hand, there is an internal SCSI-2 port to increase expandability. This unit also has four SIMM slots, which were all unobstructed and completely accessible for upgrades.

The FCS Green Pentium turned in below-average scores on all of our benchmark tests except the Graphics WinMark and processor tests. The combination of an ATI Graphics ProTurbo 64 video card and an ATI Mach 64 chip set (found in 19 of the 40 systems reviewed) helped the FCS Green Pentium post an average score on these tests. This unit's processor score was also average. All other test scores were well below average, with a third-to-last showing on our Winstone and DOS disk tests and a last-place showing on our Disk WinMark tests.

FCS offers a lifetime labor warranty; parts are under warranty for two years. The thoughtfulness of power-saving and lifetime support is encouraging; this unit's performance, however, is not.—MEB

FutureTech Systems Inc.

• FutureTech System 5490P

Priced at \$3,769—a seeming bargain for a well-outfitted 90-MHz Pentium system—the FutureTech System 5490P from FutureTech Systems certainly looks like a lot of PC for the money. Yet while the system does offer a lot of room for expansion, it doesn't offer top performance and was a decidedly lusterless competitor on our benchmark tests.

The unit came to us in a massive tower case, complete with removable wheels. The motherboard includes VL-Bus, PCI, and ISA slots. Both VL-Bus slots were free in the unit we saw; the three ISA slots were filled by an Ethernet network card, a CD-ROM interface board, and an I/O card. Of four PCI slots, two were filled with an ATI Mach 64 video card and a Tekram hard disk controller with 4MB of cache. One of the PCI slots

► FACT FILE

FutureTech System 5490P

List price: \$3,769.

Processor/Memory:

Pentium/90, 16MB

RAM, 512K external

cache. **Data storage:**

Conner 425MB IDE hard

disk, Tekram DC-690B

PCI disk controller card

with 4MB cache,

Mitsumi CRMC-FX001

CD-ROM drive. **Display:**

ATI Mach 64 PCI video

controller card with 2MB

VRAM, Kenitac 215AX

14-inch monitor with a 79-Hz refresh rate at 1,024-by-

768. **Software:** DOS

6.2, Microsoft

Windows 3.11.

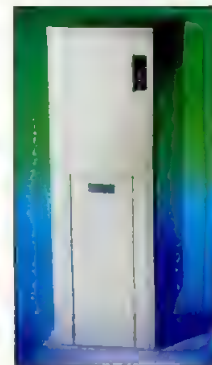
FutureTech Systems

Inc., 800-275-4414,

201-488-4414; fax,

201-488-4405.

400 on reader service card



SUITABILITY TO TASK

Windows applications **GOOD**

DOS applications **GOOD**

Expandability **GOOD**

shares a backplate with an ISA slot.

The system's large case provides easy access to the motherboard and its components, as well as to the ten drive bays, three of which—in the unit we saw—held a 425MB Conner IDE hard disk, a floppy disk drive, and a Mitsumi CD-ROM drive.

Like most of the other tested machines in this roundup that offer both PCI and VL-Bus slots, the FutureTech 5490P was generally an average or below-average performer on the majority of our benchmark tests. The system managed below-average showings on our DOS disk and DOS video tests, and it posted a slightly below-average DOSmark score as well. It garnered average scores on our Winstone, Disk WinMark, and Graphics WinMark benchmark tests.

If your expansion needs outweigh your desire for top-of-the-line performance, you may find the FutureTech 5490P attractive. To top things off, FutureTech Systems offers a 15-month parts-and-labor warranty with a year of free on-site service.—RSA

Gateway 2000 Inc.

• Gateway 2000 P5-90

Gateway 2000 has succeeded in the past by offering quality PCs at aggressive prices. The 90-MHz Pentium-based Gateway 2000 P5-90 certainly fits this formula: Its

► FACT FILE

FCS Green Pentium 90

List price: \$3,999.

Processor/Memory:

Pentium/90, 16MB

RAM, 256K external

cache. **Data storage:**

Maxtor 541MB SCSI-2

hard disk, BusLogic BT-

4453 VL-Bus disk

controller card, NEC 3Xi

CD-ROM drive. **Dis-**

play: ATI Mach 64 PCI

video controller card

with 2MB DRAM, KFC

CA 1507 15-inch moni-

tor with a 70-Hz refresh rate at 1,280-by-1,024. **Sound**

card: Creative Labs Sound Blaster ASP. **Software:**

DOS 6.2, Microsoft

Windows 3.11.

First Computer

Systems Inc., 800-

325-1911, 404-441-

1911; fax, 404-441-

1856.

400 on reader service card



SUITABILITY TO TASK

Windows applications **GOOD**

DOS applications **GOOD**

Expandability **EXCELLENT**

SUMMARY OF FEATURES

CONTINUES

Products listed in alphabetical order	AST Premia GX P/90 Model 733C	AT&T Globalyst 600	Axik Ace Power 586-90PCI	CAF Lightning P9	Comrade Professional P5/90
■ = YES □ = NO					
List price (tested configuration)	\$5,750 (estimated)	\$4,802	\$4,498	\$2,850	\$3,695
Processor type and speed	Pentium/90	Pentium/90	Pentium/90	Pentium/90	Pentium/90
Hard disk capacity and interface	730MB SCSI-2	540MB IDE	525MB SCSI-2	343MB SCSI-2	540MB IDE
Dealers/Direct-distribution channel	■ □	■ ■	□ ■	■ □	□ ■
Case style	Desktop	Desktop	Tower	Desktop	Mini-tower
Power supply (and number of connectors)	230W (5)	180W (5)	250W (6)	200W (4)	230W (6)
DOS, Microsoft Windows version	DOS 6.21, Windows 3.1	DOS 6.2, Windows for Workgroups 3.11	DOS 6.21, Windows for Workgroups 3.11	DOS 6.2, Windows 3.1	DOS 6.21, Windows for Workgroups 3.11
Warranty	3 years	3 years	1 year	1 year	1 year
On-site service charge	Included (1 year)	Included (1 year)	Included (1 year)	N/A	\$50.00 (1 year)
Processor and Memory					
Bus architecture (primary)	EISA	ISA	ISA	ISA	ISA
Bus architecture (secondary)	PCI	PCI	PCI and VL-Bus	PCI and VL-Bus	PCI
Motherboard manufacturer	AST	AT&T	Axik Computer	Aquarius Systems/CAF	Intel
Chip set manufacturer	Intel	Intel	OPTi	OPTi	Intel
Processor upgrade path	ZIF	ZIF	ZIF	ZIF	ZIF
BIOS version (or date)	AST 1.00.11	AMI/Intel (4/11/94)	AMI (5/8/94)	AMI (12/15/93)	AMI 1.00.03 AXIZ
Flash BIOS/16550 UART support	■ ■	■ ■	■ ■	■ □	■ ■
Installable system RAM	8MB-192MB	8MB-128MB	2MB-128MB	2MB-128MB	4MB-128MB
External RAM cache	256K-512K	256K	0-1MB	256K-512K	256K
Cache architecture	Direct-mapped	Direct-mapped	Two-way set-associative	Direct-mapped	Direct-mapped
Cache write design	Write-back	Write-back	Write-back	Write-back	Write-back
Components					
Available hard disk sizes	365MB-730MB	270MB-1GB	340MB-4GB	170MB-540MB	210MB-4GB
Disk controller location	Motherboard (PCI)	Motherboard	PCI card	PCI card	Motherboard (PCI)
Accessible drive bays (5.25", 3.5")	2, 1	2, 1	5, 0	2, 1	3, 2
Internal drive bays (5.25", 3.5")	0, 2	1, 1	4, 0	0, 1	0, 2
Floppy disk drives	1.44MB	1.44MB	1.44MB	1.44MB	1.44MB
CD-ROM drive	Toshiba XA-3401 TA	Sony CDU-561	NEC CDR-510	Panasonic CR-562-B	Mitsumi FX001D
ISA, EISA, MCA slots	0, 5, 0	6, 0, 0	5, 0, 0	3, 0, 0	5, 0, 0
VL-Bus, PCI, proprietary local-bus slots	0, 2, 0	0, 2, 0	2, 4, 0	2, 4, 0	0, 3, 0
Parallel, serial, mouse ports	1, 2, 1	1, 2, 1	1, 2, 0	1, 2, 0	1, 2, 0
Display circuitry location	PCI card	Motherboard (PCI)	PCI card	PCI card	PCI card
Video chip set manufacturer	ATI	ATI	S3	S3	S3
Video RAM	2MB-4MB	2MB	1MB-2MB	1MB	2MB-4MB

performance on our benchmark tests was very competitive, and its \$3,999 price includes a 17-inch Gateway-branded CrystalScan multiscanning monitor. The unit also comes with two software packages: Microsoft Office Professional and Corel Professional Photos.

The interior of the Gateway P5-90's spacious tower case easily lends itself to expansion. It includes five accessible and four internal drive bays and provides easy access to all components, including the 540MB Conner IDE hard disk and the IDE-based double-speed NEC CD-ROM drive. The unit's motherboard offers integrated IDE, floppy disk drive, and I/O connectors.

One of the test unit's three PCI expansion slots was occupied by an ATI Mach 64 PCI graphics card with 2MB of VRAM, and one of the five ISA slots was filled by a Gateway Sound Blaster-compatible sound card. The unit also came with two Yamaha speakers.

The Gateway P5-90 performed admirably on our benchmark tests. It yielded top-ten scores on our Winstone, Disk WinMark, Graphics WinMark, and DOS video tests; its DOSmark score also fell in the top ten. The system produced solidly average scores on our DOS disk and processor tests.

This machine provides the level of performance and the competitive price we

FACT FILE

Gateway 2000 P5-90

List price: \$3,999.

Processor/Memory:

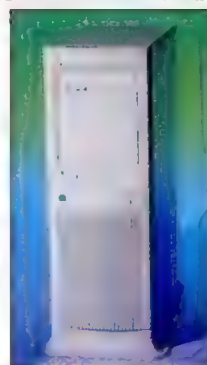
Pentium/90, 16MB RAM, 256K external cache. **Data storage:** Conner 540MB IDE hard disk, integrated PCI disk controller, NEC 2X IDE CD-ROM drive. **Display:**

ATI Mach 64 PCI video controller card with 2MB VRAM, Gateway CrystalScan 1776LE 17-inch monitor with a 72-

Hz refresh rate at 1,024-by-768. **Sound card:** Gateway 2000 16-bit sound card. **Software:** DOS 6.21, Microsoft Windows for Workgroups 3.11, Microsoft Office Professional, Corel Professional Photos.

Gateway 2000 Inc.,
800-846-2000, 605-
232-2000; fax, 605-
232-2023.

461 on reader service card



SUITABILITY TO TASK

Windows applications EXCELLENT

DOS applications EXCELLENT

Expandability FAIR

VENDOR SERVICE & RELIABILITY

Reliability ABOVE AVERAGE

Repair service ABOVE AVERAGE

Technical support ABOVE AVERAGE

have come to expect from Gateway 2000's products. The company also offers a comprehensive three-year-parts and one-year-labor warranty, with one year of free on-site service.—RSA

Hewlett Rand Corp.

• Hewlett Rand HR P5-90 Panther

The \$3,499 Hewlett Rand HR P5-90 Panther offers above-average graphics performance at a competitive price. And while expansion potential is limited in some areas, the machine is adequate otherwise.

The Hewlett Rand Panther is crowded inside, as were many of the systems we tested. A number of controller cables cover two of the Intel motherboard's five ISA slots, and one of the drive bay casings covers two of the four SIMM banks. Hewlett Rand included a 16-bit Sound Blaster sound card and installed a PCI-based NexStor SCSI-2 controller, bypassing the motherboard's integrated IDE hard disk controller.

This SCSI-2 disk controller, however, did not boost disk performance. The test

28.8K OPTIMA Modems From Hayes.

Up To Twice As Fast!

"Fastest Performance"
- PC WEEK 11/93
"Overall Speed Winner"
- InfoWorld 7/94
"Fastest Tested"
- BYTE 7/94
"Fastest Modem"
- Computer Shopper 7/94



Introducing the new OPTIMA™ 288 V.FC™ + FAX for the Macintosh™ and the new OPTIMA 288B V.FC + FAX internal modem. Like the original OPTIMA 288 for PCs, they all have Hayes™ enhanced technology to let you communicate at speeds up to twice as fast as most modems*.



VFast Class™ technology is at the heart of these new modems. By adding our enhanced V.42bis compression technology, we've been able to increase your speed up to an incredible 230,400 bit/s while ordinary 28.8 modems try to reach 115,200 bit/s. All OPTIMA 288 modems provide great solutions for remote LAN, multi-media, transferring large files, and as an alternative to Switch 56 Service. And our OPTIMA 288B internal modem has the same COM bic chip (16-bit communications co-processor) built

in as our Hayes ESP® Communications Accelerator to handle these incredible speeds and help prevent data loss. You can add this technology to any high-speed modem when you buy the Hayes ESP Communications Accelerator for only \$99^{SRP}. And all Hayes 28.8K modems are upgradeable to V.34, providing connectivity to not only the large number of installed V.FC modems but also upcoming V.34 compatible products.

Gallup Survey Finds Fortune 1000 Companies Prefer Hayes 3 to 1. You will too! Get product and V.34 upgrade details by calling 800-HAYES-28. Or call our FAX back service *Hayes FAX Response* at 800-HAYES-FX and select Document 944. In Canada, call 800-665-1259.

Hayes®
Increasing the Speed
of Business.™



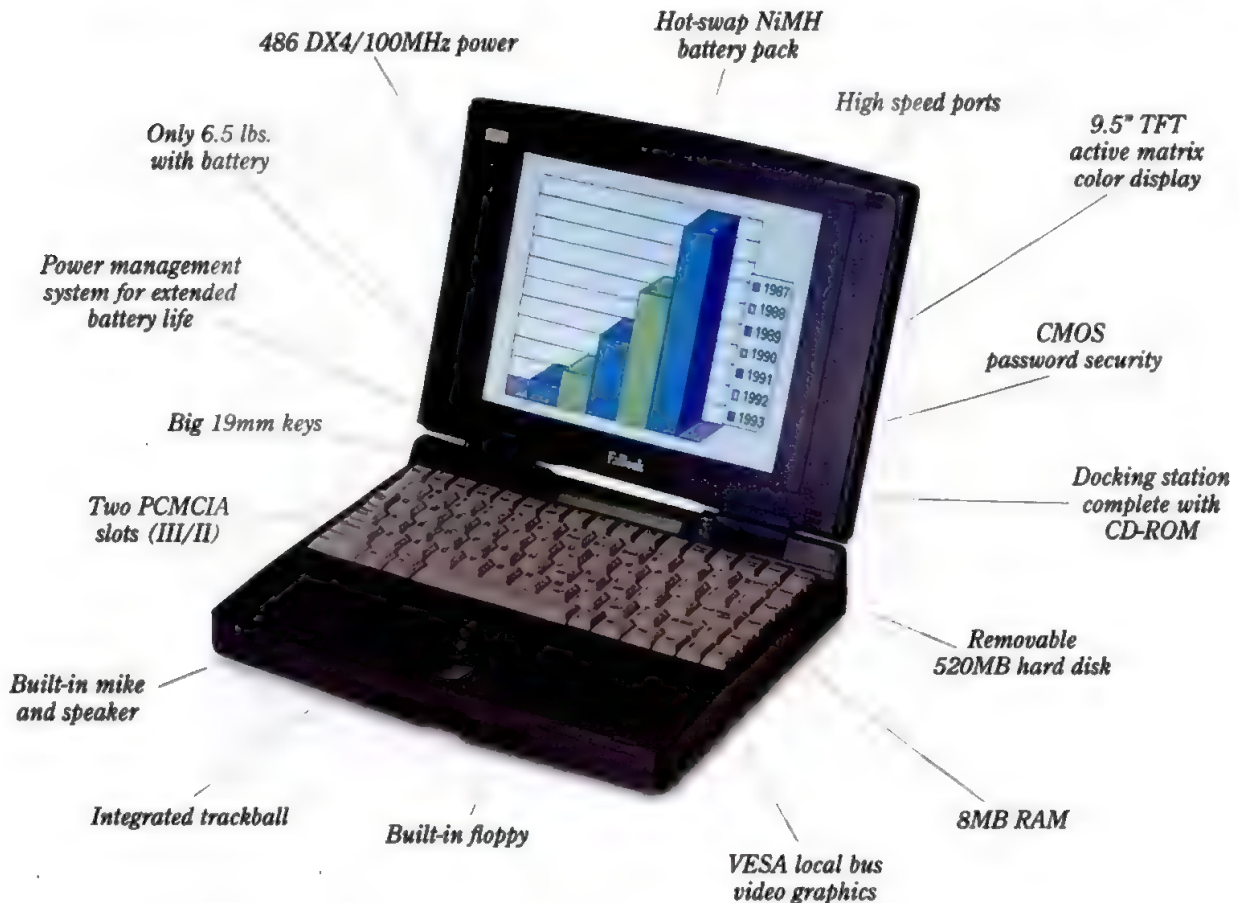
*The speed you achieve will be affected by your computer systems, communications software, and type of data being transmitted. To achieve maximum speeds, the new Hayes OPTIMA 288 high-speed modems must be used. **Fastest in four out of five file transfer tests. CRN: The Gallup Organization Inc. 1994. Go Online With Hayes BBS: in U.S. call 800-874-2937 or 404-446-6336; in Canada call 800-429-3722. ©1994 Hayes Microcomputer Products, Inc., P.O. Box 105203, Atlanta, GA 30348. Hayes, the Hayes icon, the Hayes logo and ESP are registered trademarks, and the Hayes 102 Escape Sequence Patent icon, Increasing the Speed of Business, ESP Technology icon, OPTIMA, and Smartcom are trademarks of Hayes Microcomputer Products, Inc. V Fast Class and V.FC are trademarks of Rockwell International Corporation. Other trademarks mentioned are those of their respective companies. Price is in U.S. dollars.



PC Magazine's Idea of the "Perfect Notebook."



CTX Introduces the Better-Than-Perfect Notebook.



Once again, CTX brings you more for less.

Introducing EzBook™, a powerful 486 notebook computer with all the great features PC Magazine calls for in its ideal, *hypothetical* notebook PC. And more.

More 486 DX4 power (100MHz) and 60 percent more disk capacity (520MB).

What's more, this better-than-perfect notebook is real and available now. And you can get one with its optional docking station complete with CD-ROM drive already built in for about the same low street price of \$4500.

But if you're willing to settle for just a "perfect" EzBook notebook (PC Magazine's configuration), we can save you somewhere around \$1000.

Or, if you want to save even more and be just slightly imperfect, get our economy EzBook with a monochrome or dual-scan screen, 4MB of RAM, a 260 MB disk, and no docking station for as low as \$1549. You save nearly \$3000.

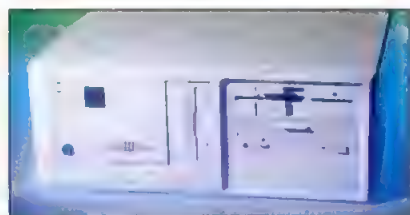
More for less. That's just what we've been offering in color monitors for years. And now we out-sell all the names you know best — like Sony, NEC, Mitsubishi, Samsung, and IBM.*

Who knows how successful CTX notebooks will be? But better-than-perfect isn't a bad place to start. Call 1-800-888-9052 ext. 101 for more information on where you can get the real, ideal notebook.



© 1994 CTX International. *Official 1993 Monitor statistics.

90-MHz Pentium PCs



► FACT FILE

Hewitt Rand P5-90 Panther

List price: \$3,499. **Processor/Memory:** Pentium/90, 16MB RAM, 256K external cache. **Data storage:** Quantum 515MB SCSI-2 hard disk, NexStor PCI disk controller card, Toshiba XM-3401 TA CD-ROM drive.

Display: ATI Mach 64 PCI video controller card with 2MB VRAM, Hewitt Rand SV15 NI/D 15-inch monitor with a 72-Hz refresh rate at 1,024-by-768. **Sound card:** Creative Labs Sound Blaster 16. **Software:** DOS 6.21, Microsoft Windows for Workgroups 3.11.

Hewitt Rand Corp.,
800-869-7074, 206-
869-5555; fax, 206-
869-5151.

462 on reader service card

SUITABILITY TO TASK

Windows applications	GOOD
DOS applications	GOOD
Expandability	GOOD

unit, with its 515MB Quantum SCSI-2 hard disk and PCI controller, posted below-average scores on our Disk WinMark and DOS disk tests. Its Winstone score was about average. The unit's bright spots were its above-average scores on our Graphics WinMark and DOS video tests—results aided by the system's PCI-based ATI Mach 64 video card. The DOS video score helped the Hewitt Rand Panther turn in an average DOSmark score.

Hewitt Rand includes an attractive two-year parts-and-labor warranty with this machine; on-site service is available at \$39 for one year. On the whole, the Hewitt Rand Panther offers strong graphics capabilities but subpar disk performance; in all other respects, the unit is an average performer.—WPF

Hewlett-Packard Co.



EDITORS' CHOICE

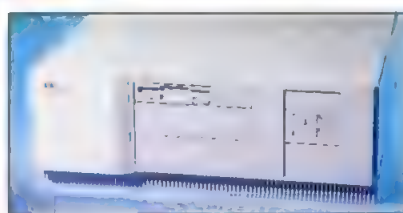
HP Vectra XU 5/90C

If the estimated street price of \$5,845 does not deter you, take a closer look at the HP Vectra XU 5/90C. Its advanced design includes integrated SCSI and Ethernet connectors (10BaseT and thin coax) and supports the MultiProcessor Specification Version 1.1 for dual processing. This price

also includes a 17-inch monitor and a three-year warranty.

Hewlett-Packard has obviously put a lot of time into this system's design. Its PCI-based motherboard is segregated into three parts. One area contains two ZIF sockets—one holding the 90-MHz Pentium processor and one sitting empty, awaiting a second Pentium CPU. In the center of the motherboard are the integrated SCSI and network connections. Finally, four ISA slots and two PCI slots are provided. The power switch and LED indicators are built into an external panel, which can be removed and rotated to accommodate a tower or desktop orientation.

The system's performance on our Windows-based tests was outstanding. Its Winstone score was excellent, and its Disk WinMark score was well above average. The test unit, which used a PCI-based Matrox MGA video card, turned in an above-average though not exceptional Graphics WinMark score. This machine's performance under DOS was poor, with a DOSmark score that fell far below the group's average. Its DOS video score was well below average as well, but the unit turned in a competitive DOS disk score



► FACT FILE

HP Vectra XU 5/90C

List price: \$5,845 (estimated). **Processor/Memory:** Pentium/90, 16MB RAM, 512K external cache. **Data storage:** Quantum 540MB IDE hard disk, integrated PCI disk controller, Toshiba XM 4101 CD-ROM drive.

Display: Matrox MGA Ultima Plus PCI video controller card with 2MB VRAM, Hewlett Packard Ultra D280A 17-inch monitor with a 75-Hz refresh rate at 1,024-by-768.

Software: DOS 6.2, Microsoft Windows for Workgroups 3.11, Dashboard for Windows.

Hewlett-Packard Co.,
800-752-0900, 303-
635-1000.

463 on reader service card

SUITABILITY TO TASK

Windows applications	EXCELLENT
DOS applications	FAIR
Expandability	EXCELLENT

VENDOR SERVICE & RELIABILITY

Reliability	ABOVE AVERAGE
Repair service	ABOVE AVERAGE
Technical support	ABOVE AVERAGE

and an excellent processor score.

The HP Vectra XU 5/90C faces more competition today that it did when we gave it an Editors' Choice award in our issue of June 28, 1994. Even so, few machines can match its combination of powerful Windows performance, elegant design, and built-in SCSI and Ethernet functionality.—WPF

Initiative Technology Inc.

• Initiative Technology ITI 590 Pi

The Initiative Technology ITI 590 Pi represents this company's first entry into the Pentium market. The system is well-laid-out, its components are easily accessible, and it includes some nice extras. On the downside, the machine's performance on



► FACT FILE

Initiative Technology ITI 590 Pi

List price: \$4,429. **Processor/Memory:** Pentium/90, 16MB RAM, 256K external cache. **Data storage:** Conner 545MB IDE hard disk, integrated PCI disk controller, NEC 3Xi CD-ROM drive. **Display:** Diamond Viper PCI video controller card with 2MB VRAM, NEC Multi-Sync 3V 15-inch monitor with a 90-Hz refresh rate at 1,024-by-768. **Software:** DOS 6.21, Microsoft Windows for Workgroups 3.11.

Initiative Technology
Inc., 800-999-1413,
915-643-1845; fax,
915-643-4912.

464 on reader service card

SUITABILITY TO TASK

Windows applications	GOOD
DOS applications	GOOD
Expandability	GOOD

our benchmark tests was uninspiring, and its price—\$4,429—is rather high.

Take off the cover of this standard desktop case and you will find a cleanly designed system. Cables and drive assemblies don't block access to expansion slots or SIMM sockets on the motherboard. This system also has adequate room for expansion, with five front-accessible drive bays, six SIMM banks, five ISA slots, and three PCI slots (one of which shares a backplate with an ISA slot). The Initiative 590 Pi we tested came with a 15-inch NEC monitor and an NEC triple-speed CD-ROM drive.

Experts Agree The ZEOS® Pantera™ Is The No.1 Pentium PC.



Twelve awards, five leading publications...and we're still counting. It's the obvious choice. Get your Editors' Choice, Best, Experts' Pick, Best Buy, Top Choice, ZEOS PC now! Call your ZEOS Systems Consultant today at 800-554-7172.



"In terms of performance, the Pantera-66 left little to be desired...this machine laid claim to no low scores whatsoever."

PC Magazine Editors' Choice



"A standout in speed and value...we suggest you spend your money on this machine - it offers the best value of any system we tested."

PC/Computing BEST



June 1994
Pentium-60
August 1994
Pentium-60

"ZEOS set the standard... the obvious choice among the group."

Computer Shopper No. 1 Choice



"They don't come any faster. This is as good as it gets...It's lightning fast, beautifully configured, and priced right."

PC World Best Buy



June 1994
Pentium-66
August 1994
Pentium-90

"ZEOS Pantera rose above the crowd and posted the most impressive performance numbers."

Windows Sources
Experts' Pick

September 1994
Pentium-60
September 1994
Pentium-66

August 1994
Pentium-60
August 1994
Pentium-66

July 1994
Pentium-66
June 1994
Pentium-66

Editors' Choice, Experts' Pick & No.1 Choice ZEOS PC

Pentium-60	\$2895
Pentium-66	\$2995
Pentium-90	\$3195

- ▶ Intel 60MHz, 66MHz or 90MHz Pentium CPU
- ▶ 16MB RAM, 256K SRAM cache
- ▶ 528MB local bus IDE hard drive, 256K cache
- ▶ 2X CD-ROM, 3.5" 1.44MB floppy drive
- ▶ Diamond Stealth 64/PCI local bus SVGA color graphics card with 2MB VRAM
- ▶ 15" 1024 x 768 non-interlaced SVGA color monitor, .28mm dot pitch
- ▶ 2 high-speed serial ports, 1 enhanced parallel port
- ▶ Integrated business audio
- ▶ On-board SCSI socket
- ▶ 10-bay vertical case with two cooling fans
- ▶ 101-key space-saving keyboard
- ▶ Microsoft DOS 6.2 with Enhanced Tools, Windows for Workgroups 3.11, choice of Lotus Windows application



BEST & Experts' Pick ZEOS Multimedia PC

Pentium-60	\$3438
Pentium-66	\$3538
Pentium-90	\$3738

The above PC modified to include:

- ▶ 16-bit sound card
- ▶ Amplified stereo speakers
- ▶ 17" 1280 x 1024 non-interlaced SVGA color monitor, .28mm dot pitch, upgrade

800-554-7172

24 Hours a Day
365 Days a Year



Purchase orders are subject to approval. Business leasing programs available. All prices, specifications and availability are subject to change without notice; call to confirm these and warranty details. Prices do not include shipping. All products and company names are trademarks or registered trademarks of their respective holders. Intel Inside and Pentium Processor logos are trademarks of Intel Corporation. ZEOS is a registered trademark. Computers Now is a registered servicemark. Pantera is a trademark of ZEOS International Ltd. © 1994 ZEOS International Ltd., 1301 Industrial Blvd., Minneapolis, MN 55413 USA. ZEOS is a publicly traded company (NASDAQ symbol: ZEOS) PEN PCM 94098

CIRCLE 125 ON READER SERVICE CARD

SUMMARY OF FEATURES

CONTINUES

Products listed in alphabetical order

■ = YES □ = NO

	Dell Dimension XPS P90	Diamond DT 586-90	EPS P90 Explorer	FCS Green Pentium 90	FutureTech System 5400P
List price (tested configuration)	\$3,749	\$3,659	\$4,445	\$3,999	\$3,769
Processor type and speed	Pentium/90	Pentium/90	Pentium/90	Pentium/90	Pentium/90
Hard disk capacity and interface	1GB IDE	345MB SCSI-2	540MB SCSI-2	541MB SCSI-2	425MB IDE
Dealers/Direct-distribution channel	□ ■	■ ■	□ ■	□ ■	■ ■
Case style	Desktop	Desktop	Desktop	Tower	Tower
Power supply (and number of connectors)	200W (5)	230W (6)	300W (5)	250W (9)	300W (10)
DOS, Microsoft Windows version	DOS 6.21, Windows for Workgroups 3.11	DOS 6.21, Windows 3.11	DOS 6.2, Windows 3.1	DOS 6.2, Windows 3.11	DOS 6.2, Windows 3.11
Warranty	1 year	3 years	3 years parts, 1 year labor	2 years parts, lifetime labor	15 months
On-site service charge	Included (1 year)	Included (1 year)	Included (1 year)	Included (1 year)	Included (1 year)
Processor and Memory					
Bus architecture (primary)	ISA	ISA	ISA	ISA	ISA
Bus architecture (secondary)	PCI	PCI and VL-Bus	PCI and VL-Bus	PCI and VL-Bus	PCI and VL-Bus
Motherboard manufacturer	Intel/Dell	Super Micro	EPS	Super Micro	Mars Technologies
Chip set manufacturer	Intel	OPTi	OPTi	OPTi	OPTi
Processor upgrade path	ZIF	ZIF	ZIF	ZIF	ZIF
BIOS version (or date)	AMI/Dell A03	AMI (5/2/94)	AMI (12/15/93)	AMI (12/15/93)	AMI (5/2/94)
Flash BIOS/16550 UART support	■ ■	■ ■	■ □	■ ■	■ □
Installable system RAM	8MB-128MB	2MB-128MB	1MB-128MB	2MB-128MB	2MB-256MB
External RAM cache	256K	128K-512K	64K-1MB	256K-1MB	256K-512K
Cache architecture	Direct-mapped	Direct-mapped	Two-way set-associative	Direct-mapped	Direct-mapped
Cache write design	Write-back	Write-through	Write-back	Write-through	Write-back
Components					
Available hard disk sizes	340MB-1.1GB	345MB-4GB	270MB-3GB	420MB-3.3GB	212MB-4GB
Disk controller location	Motherboard (PCI)	VL-Bus card	PCI card	VL-Bus card	PCI card
Accessible drive bays (5.25", 3.5")	3, 0	3, 2	2, 2	5, 2	5, 2
Internal drive bays (5.25", 3.5")	0, 2	0, 1	2, 0	3, 0	0, 3
Floppy disk drives	Dual 1.2MB/1.44MB	Dual 1.2MB/1.44MB	1.44MB	1.44MB	1.44MB
CD-ROM drive	Panasonic CR563	Toshiba TXM3401B	Plexor DM-302B	NEC 3XG	Mitsumi FX-001
ISA, EISA, MCA slots	5, 0, 0	3, 0, 0	3, 0, 0	5, 0, 0	3, 0, 0
VL-Bus, PCI, proprietary local-bus slots	0, 3, 0	2, 4, 0	2, 4, 0	2, 4, 0	2, 4, 0
Parallel, serial, mouse ports	1, 2, 1	1, 2, 0	1, 2, 0	1, 2, 0	1, 2, 0
Display circuitry location	PCI card	PCI card	PCI card	PCI card	PCI card
Video chip set manufacturer	S3	S3	S3	ATI	ATI
Video RAM	2MB-4MB	2MB-4MB	2MB-4MB	2MB	2MB-4MB

This unit's best performance was on our processor tests, where its score was only average despite a 256K synchronous external processor cache. On the remainder of our tests, the system's performance was even weaker. Its Weitek-based Diamond Viper PCI graphics board is a 32-bit board competing with 64-bit products, so it is not surprising that the unit turned in markedly below-average scores on our DOS video and Graphics WinMark tests. Disk scores were also below average under both DOS and Windows. Poor Windows performance was the result of an IDE disk subsystem that did not support 32-bit disk access under Windows. The unit's Winstone and DOS-

mark scores were below average as well.

The Initiative Technology ITI 590 Pi demonstrates that using a high-speed CPU is simply not enough. All components must be carefully chosen and implemented to provide top-flight performance.—CV

Insight Direct Inc.

● Insight PCI P90 SCSI

Insight Direct sells its Insight PCI P90 SCSI for \$5,399. That may seem like a lot until you consider that the price includes a 17-inch monitor and a 2.1GB SCSI-2 hard disk (this hard disk adds \$1,699 to the price). The system's performance on our Windows-based benchmark tests was

► FACT FILE

Insight PCI P90 SCSI

List price: \$5,399.

Processor/Memory:

Pentium/90, 16MB RAM, 256K external cache. **Data storage:** Seagate 2.1GB SCSI-2 hard disk with 512K cache, PCI disk controller card, Plexor TX302B CD-ROM drive. **Display:** Matrox MGA PCI video controller card with 2MB VRAM, View-Sonic 17 17-inch monitor with a 76-Hz refresh rate at 1,024-by-768.



Software: DOS

6.21, Microsoft Windows for Workgroups 3.11, National Parks MPC CDR, Adventures MPC CD-ROM, Fractal Ecstasy MPC CD-ROM.

Insight Direct Inc.,

800-729-0770, 602-902-1000; fax, 602-902-1180.

465 on reader service card

SUITABILITY TO TASK

Windows applications **EXCELLENT**

DOS applications **FAIR**

Expandability **GOOD**

VENDOR SERVICE & RELIABILITY

Reliability **ABOVE AVERAGE**

Repair service **ABOVE AVERAGE**

Technical support **ABOVE AVERAGE**

solid, so you might consider it if you're looking for a reasonably priced high-end graphics workstation.

The unit's tower case offers excellent expansion potential. There are five front-accessible drive bays, with two left open in our test configuration; the other three were occupied by the hard disk, floppy disk drive, and CD-ROM drive. There are also five internal 3.5-inch bays, all of them free.

All five ISA slots were free in our test unit. Two of the three PCI slots on the Intel motherboard (including one shared-backplate ISA/PCI slot) were occupied: one by the SCSI-2 hard disk and CD-ROM drive controller; the other, by a Matrox MGA graphics card with 2MB of VRAM. Main memory is expandable to 128MB; external cache is fixed at 256K.

The Insight PCI P90's performance on our Windows-based benchmark tests was generally strong. Its Graphics WinMark score was above average. The Winstone score was also above average, but only slightly. Under DOS, performance was not as impressive: The DOS video score was far below average, bringing the DOS-

WinBook XP

Highest quality, best features, lowest price!

Speed and Power



Your Choice...

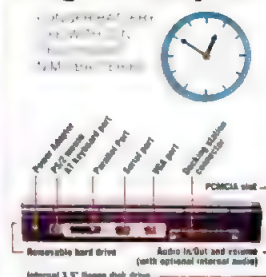


Great Ergonomic Features



WinBook
COMPUTER CORPORATION
a subsidiary of Micro Electronics, Inc.

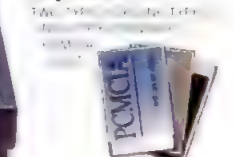
Longer Battery Life



Upgradability



PCMCIA Expansion



The 75MHz WinBook XP

The only feature we forgot was the high price tag.



August 1994
WinBook XP DX2/50
4/260 Monochrome

Full of features and plans for a big future—the 75MHz WinBook® XP brings you up to a new height in performance and value. The 32-bit local bus video Rocketchip accelerator boosts your graphics performance level and a ten-cell NiMH 2500mA battery pack lets you run power-hungry programs longer. Plus an LCD indicator lets you monitor functions at a glance. You get the same unique ergonomic features that critics raved about with the original WinBook—full size keys, a sloping wrist rest, and now your choice between the standard pointing stick or an optional 19mm dual-button trackball.

WinBook XP components are upgradable with user-upgradable RAM to 32MB, upgradable screen, removable hard drives to 520MB capacity and PCMCIA capabilities. Options include a 14.4 fax/voice/data modem, internal audio and docking station.

Along with your WinBook XP, you get excellent support, a 30-day money-back guarantee, quick service turn-around, a one-year limited warranty on parts and labor plus toll-free technical support for the life of your computer. Your purchase is backed by 15 years of computer experience and over 2.8 million satisfied customers. Call us toll-free to order your WinBook XP today.

WINBOOK XP FEATURES

- SL ENHANCED INTEL 486 DX4-75MHz
- WEIGHT 5.9 LBS. DUAL-SCAN COLOR 6.1 LBS. OPTIONAL ACTIVE MATRIX COLOR
- DIMENSIONS 11.3" X 8.5" X 1.7"
- 4 OR 8MB RAM (EXPANDS TO 16 OR 32MB)
- 3.5" 1.44MB DISKETTE DRIVE
- REMOVABLE 120 TO 520MB HARD DRIVE
- VGA DUAL SCAN STN COLOR OR OPTIONAL ACTIVE MATRIX DISPLAY
- 10 CELL 2500mA NiMH BATTERY & AC PACK
- SUSPEND/RESUME FEATURE
- TWO TYPE II OR ONE TYPE III PCMCIA SLOT
- INTEGRATED DUAL BUTTON POINTING STICK OR OPTIONAL DUAL-BUTTON 19mm TRACKBALL
- PARALLEL SERIAL & PS/2 PORTS
- 1MB VIDEO MEMORY WITH EXTERNAL VGA PORT
- LCD FUNCTION INDICATOR PANEL
- 14.4 INTERNAL SEND/RECEIVE FAX/VOICE/DATA MODEM OPTIONAL
- INTERNAL AUDIO OPTIONAL
- DOCKING STATION OPTIONAL

\$1999

\$2999

- Intel 486 DX4 75MHz
- Dual Scan Color
- 4MB RAM
- 120MB Hard Drive

OTHER MODELS AVAILABLE

CALL NOW TOLL-FREE

1-800-468-2139

Monday-Friday, 8am-9pm EST • Saturday, 9am-4pm
1160 Steelwood Rd. Columbus, OH 43212 • FAX: 1-800-448-0308

©1994 WinBook Computer Corporation. All rights reserved. WinBook and Micro Center are registered trademarks of Micro Electronics, Inc. The Intel Inside logo is a registered trademark of the Intel Corporation. All other trademarks and registered trademarks are property of their respective corporations.

EASY PAYMENT OPTIONS

MasterCard, Visa, Discover Card, Micro Center® charge, personal check or P.O. with credit approval.



30-DAY UNCONDITIONAL MONEY BACK GUARANTEE

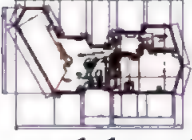
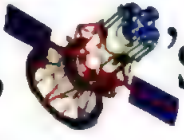
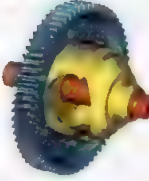
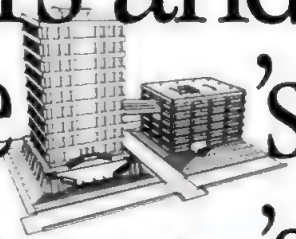
Your satisfaction is unconditionally guaranteed for 30 days from date of purchase. If for any reason you are not satisfied with your purchase from us, we will be glad to give you your money back.

CIRCLE 085 ON READER SERVICE CARD

WESTERN DIGITAL
ROCKETCHIP
VIDEO GRAPHICS ACCELERATION



Yes,
 you can do Windows™
 and walls and doors and
 floors, ceilings, whole 's,
 's, trains, boats, 's,
 chains, 's, diamond rings, 's
 and things, 's, power plants, topo maps,
 's, helicopters, roads
 and bridges, circuit boards, 's
 power lines, 's, airports, furniture,
 digital terrain models, 's, skateboards, the
 's, chemical plants, 's, golf courses,
 anything you can think of ... even the kitchen



**MicroStation.
 CAD software for Windows
 and Windows NT**

Open yourself to a world of design possibilities with MicroStation CAD software. From 2D drafting to advanced 3D surface modeling, MicroStation Version 5 is the ultimate design tool for the Windows environment. And the most complete, with photorealistic rendering and animation. All in one package!

Join the many designers who have made the move to the CAD tool for the '90s.

Call 800-345-4856 for a free demo disk and brochure on MicroStation.

 **MicroStation**
 CAD for the '90s

INTERGRAPH

MicroStation models courtesy of Viewpoint Animation Engineering. Intergraph and the Intergraph logo are registered trademarks of Intergraph Corporation. MicroStation is a registered trademark of Bentley Systems Inc., an Intergraph affiliate. Other brands and product names are trademarks of their respective owners. © 1995 Intergraph Corporation, Huntsville, AL 35894-0001. DDAD140AD

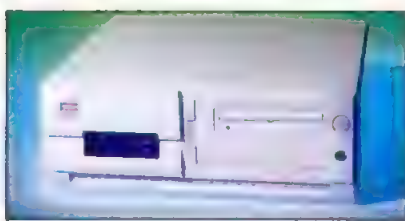
mark score below average as well. This unit, with its Seagate hard disk and Intel hard disk controller, managed an above-average score on our DOS disk tests. On our Disk WinMark tests, its score was somewhat below average though very competitive when compared with the scores of other units using SCSI hard disks. The system's processor score was average.

This system is covered by a one-year parts-and-labor warranty, but on-site service is not available through Insight. —Anush Yegyzarian

Mega Computer Corp.

● Mega Impact P90PCI/VLB+

For \$3,825, the Mega Impact P90PCI/VLB+ includes an ATI Graphics ProTurbo graphics card with 4MB of VRAM and a motherboard that is both VL-Bus- and PCI-compliant. In terms of benchmark test



▶ FACT FILE

Mega Impact P90PCI/VLB+

List price: \$3,825. **Processor/Memory:** Pentium/90, 16MB RAM, 512K external cache. **Data storage:** Maxtor 519MB SCSI-2 hard disk, PCI disk controller card, Sony CDU-33A-01 CD-ROM drive. **Display:** ATI Graphic Turbo PCI video controller with 4MB VRAM, MGC1506-XGA 15-inch monitor with a 70-Hz refresh rate at 1,024-by-768. **Software:** DOS 6.2, Microsoft Windows 3.1.

Mega Computer Corp., 800-338-6628, 619-487-8888; fax, 619-485-1518.

468 on reader service card

SUITABILITY TO TASK	
Windows applications	GOOD
DOS applications	GOOD
Expandability	GOOD

performance, the Mega Impact was roughly average. This system's interior design, however, serves to limit its expansion potential.

This unit's Super Micro motherboard, powered by an OPTi chip set, has nine expansion slots. One of these is a shared ISA/PCI slot, so a total of eight are usable at any one time.

In our test unit, one ISA slot was filled with a CD-ROM controller card, which

blocked the use of one VL-Bus slot. Another ISA slot held a dual-function I/O-floppy disk drive controller card, which also filled the back panel of the neighboring shared ISA/PCI slot, so that slot was unusable as well. Two more PCI slots were occupied: One was filled by the unit's Mach 64-powered ATI Graphics ProTurbo graphics card; the other contained the hard disk controller. As a result, only one PCI slot was left open.

On our benchmark tests, the Mega Impact generated average Winstone and Graphics WinMark scores. Its weak spot on our Windows-based tests appeared on the Disk WinMark tests, where the system's 540MB Maxtor SCSI-2 hard disk and QLogic FastSCSI hard disk controller contributed to a significantly below-average score. When compared with other units in this roundup that used SCSI hard disks, however, the system performed quite well.

On our DOS-based tests, the unit's video score fell below the average score for the group, but its disk score was above average and helped boost the DOSmark score to almost average as well. This machine's processor score was among the lowest in this roundup.

Mega Computer Corp. backs this system with a one-year warranty.—WPF

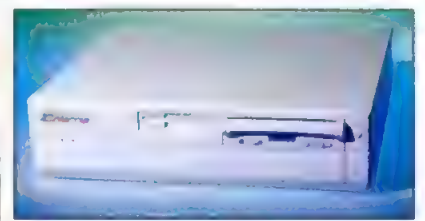
Memorex Telex Corp.

● Memorex Telex Celerria LP90

The Memorex Telex Celerria LP90, from corporate and government direct-marketer Memorex Telex Corp., offers solid Windows performance and some quality peripherals. Unfortunately, expansion potential is limited, and this system's price of \$6,263, though it includes 24MB of RAM and a triple-speed CD-ROM drive, is the highest of any machine we tested in this roundup.

Memorex Telex has a catchy motto: "We connect IBM to the rest of the world." But that may be a difficult goal to realize with this slimline system. It has four drive bays; in our test configuration, three were occupied: one by the hard disk, one by a 3.5-inch floppy disk drive, and the third by an NEC MultiSpin triple-speed CD-ROM drive.

The system's expansion slots are locat-



▶ FACT FILE

Memorex Telex Celerria LP90

List price: \$6,263. **Processor/Memory:** Pentium/90, 24MB RAM, 256K external cache. **Data storage:** Maxtor 522MB IDE hard disk with 256K cache, integrated disk controller, NEC MultiSpin 3Xi CD-ROM drive. **Display:** Matrox Vision PCI video controller card with 2MB VRAM, Memorex Telex 3109 15-inch monitor with a 75-Hz refresh rate at 1,024-by-768.

Software: DOS 6.2, Microsoft Windows for Workgroups 3.11.

Memorex Telex, 214-444-3500; fax, 214-444-3501.

467 on reader service card

SUITABILITY TO TASK

Windows applications	GOOD
DOS applications	FAIR
Expandability	FAIR

ed on a riser card plugged into the unit's Intel motherboard. Two 16-bit ISA slots, one PCI slot, and one shared ISA/PCI slot are provided. The system has four SIMM banks, although the two free sockets are blocked by the drive bay assembly.

The Memorex Telex Celerria's performance on our benchmark tests was mixed. Under Windows, the system fared well: Its scores on our Graphics WinMark, Disk WinMark, and Winstone tests were all slightly above the average for this group. Processor performance was also good, putting this unit in the top ten. But even though this unit's DOS disk score was near-average, its DOS video score was one of the lowest in the group (typical of Matrox graphics cards), which contributed to this system's last-place DOSmark score.

Despite the extras this machine has to offer, its high price should make you stop and think before you buy.—CV

Micro Express

● MicroFLEX-VL/ Pentium/90

The \$2,999 MicroFLEX-VL/Pentium/90, from Micro Express, is competitively priced and was a strong performer on the majority of our Windows-based performance tests. Combine these assets with the expansion potential of a tower system

SUMMARY OF FEATURES

CONTINUES



Products listed in alphabetical order
■ = YES □ = NO

	Gateway 2000 P5-90	Hewlett-Packard HP PS-90 Panther	HP Vectra LX 5/90C	Initiative Technology ITI 990 PI	Insight PCI P90 SCSI
List price (tested configuration)	\$3,999	\$3,499	\$5,845 (estimated)	\$4,425	\$5,399
Processor type and speed	Pentium/90	Pentium/90	Pentium/90	Pentium/90	Pentium/90
Hard disk capacity and interface	540MB IDE	515MB SCSI-2	540MB IDE	545MB IDE	2.1GB SCSI-2
Dealers/Direct-distribution channel	□ ■	■ □	■ □	■ □	□ ■
Case style	Tower	Desktop	Desktop	Desktop	Tower
Power supply (and number of connectors)	300W (6)	200W (6)	180W (4)	400W (5)	250W (6)
DOS, Microsoft Windows version	DOS 6.21, Windows for Workgroups 3.11	DOS 6.21, Windows for Workgroups 3.11	DOS 6.2, Windows for Workgroups 3.11	DOS 6.21, Windows for Workgroups 3.11	DOS 6.21, Windows for Workgroups 3.11
Warranty	3 years parts, 1 year labor	2 years	3 years	1 year	1 year
On-site service charge	Included (1 year)	\$39.00 (1 year)	Included (1 year)	N/A	N/A
Processor and Memory					
Bus architecture (primary)	ISA	ISA	ISA	ISA	ISA
Bus architecture (secondary)	PCI	PCI	PCI	PCI	PCI
Motherboard manufacturer	Intel	Intel	Hewlett-Packard	Microchips	Intel
Chip set manufacturer	Intel	Intel	Intel	Intel	Intel
Processor upgrade path	ZIF	ZIF	ZIF	ZIF	ZIF
BIOS version (or date)	AMI 1.00.05.Ax1	AMI (11/11/92)	Phoenix (5/13/94)	Phoenix (5/15/94)	AMI 1.00.05.Ax1
Flesh BIOS/16550 UART support	■ ■	■ ■	■ ■	■ ■	■ ■
Installable system RAM	16MB-128MB	2MB-128MB	8MB-256MB	8MB-192MB	1MB-128MB
External RAM cache	256K	256K	256K-512K	256K-512K	256K
Cache architecture	Direct-mapped	Direct-mapped	Direct-mapped	Direct-mapped	Direct-mapped
Cache write design	Write-back	Write-back	Write-back	Write-back	Write-back
Components					
Available hard disk sizes	340MB-1GB	250MB-9GB	270MB-1GB	215MB-2GB	40MB-4GB
Disk controller location	Motherboard (PCI)	PCI card	Motherboard (PCI)	Motherboard (PCI)	PCI card
Accessible drive bays (5.25", 3.5")	4, 1	3, 2	2, 1	3, 2	4, 1
Internal drive bays (5.25", 3.5")	0, 4	0, 0	0, 0	3, 3	0, 8
Floppy disk drives	1.44MB	1.2MB, 1.44MB	1.44MB	Dual 1.2MB/ 1.44MB	1.44MB
CD-ROM drive	NEC 2X IDE	Toshiba XM-3401TA	Toshiba XM-4101	NEC 3X	Pioneer DX3029
ISA, EISA, MCA slots	5, 0, 0	5, 0, 0	4, 0, 0	5, 0, 0	5, 0, 0
VL-Bus, PCI, proprietary local bus slots	0, 3, 0	0, 3, 0	0, 2, 0	0, 2, 0	0, 3, 0
Parallel, serial, mouse ports	1, 2, 0	1, 2, 0	1, 1, 1	1, 2, 1	1, 2, 0
Display circuitry location	PCI card	PCI card	PCI card	PCI card	PCI card
Video chip set manufacturer	ATI	ATI	Matrox	Wetake	Matrox
Video RAM	2MB	2MB-4MB	2MB-4MB	1MB-2MB	2MB

N/A—Not applicable. The product does not have this feature.

and a well-laid-out motherboard and you have a unit that boasts a distinct advantage over more expensive systems that attempt to do more and fail.

Internally, this system offers no surprises. The tower case provides five front-accessible drive bays and seven internal drive bays. The unit's proprietary motherboard, powered by an OPTi chip set, provides five ISA slots and three VL-Bus slots, although three of the slots cannot take full-size cards because of the positioning of the processor's heat sink.

Even on the performance side, Micro Express throws no curves. With the exception of a below-average Disk WinMark score, the majority of the system's

test scores were average. This unit, which uses a 541MB Conner hard disk with a 1MB caching controller, performed poorly on our Disk WinMark tests; its DOS disk score, too, was slightly lower than the average for the group.

The machine's Winstone score was in the top quarter of the group, and its Graphics WinMark score was also above average, thanks largely to the VL-Bus-based ATI Mach 64 graphics subsystem. On our DOS-based tests, the system's scores were closer to the group's averages.

Micro Express includes a two-year parts-and-labor warranty with this system. One year of on-site service costs an additional \$50. The MicroFLEX-VL/Pen-

FACT FILE

MicroFLEX-VL/Pentium/90

List price: \$2,999.

Processor/Memory: Pentium/90, 16MB RAM, 256K external cache. **Data storage:** Conner 541MB IDE hard disk, VL-Bus disk controller card, Sony CDU-33A-01 CD-ROM drive. **Display:** ATI Mach 64/Winturbo VL-Bus video controller card with 2MB VRAM, Micro Express FM590 15-inch monitor with a 57-Hz refresh rate at 1,024-by-768. **Software:** DOS 6.21, Microsoft Windows 3.1.

Micro Express, 800-989-9900, 714-852-1400; fax, 714-852-1225.

488 on reader service card



SUITABILITY TO TASK

Windows applications	EXCELLENT
DOS applications	GOOD
Expandability	EXCELLENT

tium/90 is a solid machine in terms of both construction and performance. Its price makes it that much more attractive to users looking for an affordable and flexible system.—WPF

Micron Computer Inc.

• Micron P90PCI PowerStation

With the \$3,999 Micron P90PCI PowerStation—an Editors' Choice winner in our roundup of June 28, 1994—Micron Computer has succeeded in building a strong Windows workstation using a Micronics motherboard and a group of quality components, which includes a 17-inch monitor. The system remains an above-average performer, but it does not stand apart from the pack as much now as it did when we tested it previously.

This system is well-laid-out internally and achieves high-end Windows performance without sacrificing expandability. Micron put a PCI-based Matrox video card into the shared slot of our test unit, leaving two of three PCI slots and four of five ISA slots available. One of the three external drive bays and one of the two internal drives bays are open as well. Micron elected to provide us with 32MB of RAM, instead of with the 16MB of RAM that comes standard on most machines.

DELL LATITUDE XP
INTEL® P4 730MHz SYSTEM

\$3399

BUSINESS LEASE: \$126/MO.

• 9.5" DUAL SCAN STN COLOR

• 8MB RAM (36MB MAX RAM)

• 340MB HARD DRIVE

ORDER CODE #600011



7 ports on our Advanced Port Replicator (complete with Ethernet 10Base-T and SCSI-2) virtually turns your Latitude XP into a desktop for only \$199.

524MB of hard drive space is available
Need we say more?

A 33 volt processor consumes fewer watts and pumps out hours of power so you can cruise.

8

8 hours of battery life. Yes, you read it right: 8 hours.

7

6

6 lbs. of Latitude* or 5.9 lbs. of Latitude XP and you still get 8 hours of power and 32-bit local bus video on the road.

5

4

P4 100MHz processor – the fastest clock speed you can buy in a notebook, and it's available on Latitude XP systems.

3

2

2 ways of getting 8 hours out of your Dell notebook: The 8-hour Smart Lithium Ion battery on the Latitude XP. Or 2 bays for two 4-hour NiMH batteries on the Latitude.

Swappable hard drives

Lat

Advanced Port Replicator

means you can connect all your

peripherals to the

Advanced Port Replicator

on the Latitude XP

1MB video RAM

video performance

For RAM, we offer **RAM expansion**
upto **36MB** on the Latitude XP



THE DELL LATITUDE XP COOL, HUMPH



DELL LATITUDE XP INTEL® X4 75MHz SYSTEM

\$3399

BUSINESS LEASE: \$126/MO.

- 9.5" DUAL SCAN STN COLOR
- 8MB RAM (36MB MAX RAM)
- 340MB HARD DRIVE
- NEW SMART LITHIUM ION BATTERY
- 3-YEAR WARRANTY*
- 30-DAY MONEY-BACK GUARANTEE

ORDER CODE #600011

DELL LATITUDE XP INTEL® X4 75MHz SYSTEM

\$3699

BUSINESS LEASE: \$134/MO.

- 9.5" DUAL SCAN STN COLOR
- 8MB RAM (36MB MAX RAM)
- 524MB HARD DRIVE
- NEW SMART LITHIUM ION BATTERY
- 3-YEAR WARRANTY
- 30-DAY MONEY-BACK GUARANTEE

ORDER CODE #600013

DELL LATITUDE XP INTEL® X4 100MHz SYSTEM

\$4799

BUSINESS LEASE: \$173/MO.

- 9.5" ACTIVE MATRIX TFT COLOR
- 8MB RAM (36MB MAX RAM)
- 340MB HARD DRIVE
- NEW SMART LITHIUM ION BATTERY
- 3-YEAR WARRANTY
- 30-DAY MONEY-BACK GUARANTEE

ORDER CODE #600012

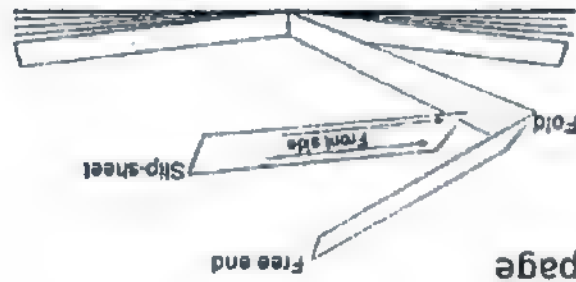
TO ORDER, CALL NOW.

800-243-2692

In Canada, Call 800-668-3021

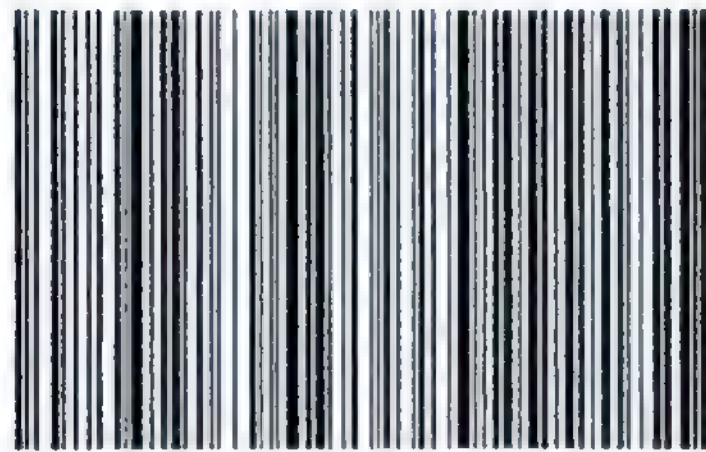
Mon-Fri 7am-9pm CT • Sat 10am-6pm CT • Sun 12pm-5pm CT
In Mexico City, Call 800-228-7811. Keycode #11BNU

DELL™



1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet

Inverted Foldout slip-sheet

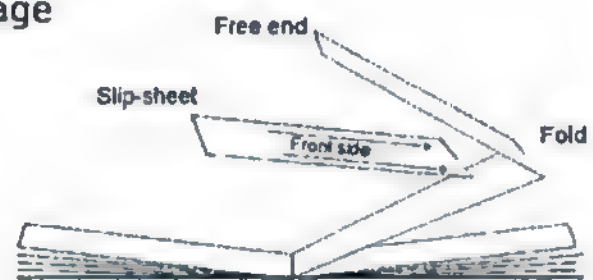


GbsSlipSheet-001

Folded edge of the page

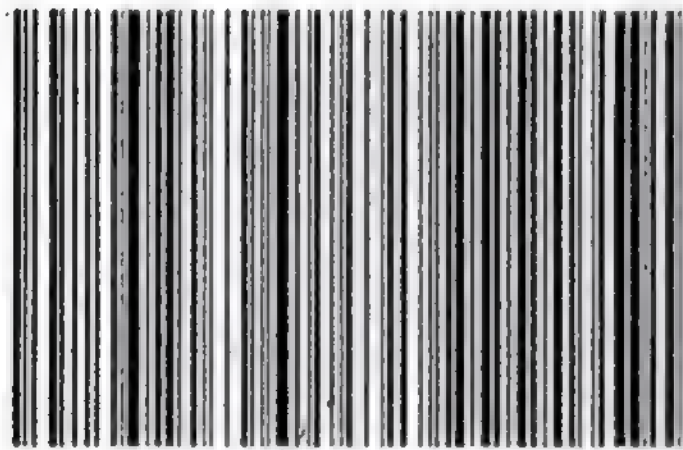
Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back



GbsSlpBack-001B

Back

1. Follow instructions on the other side

#1 in the independent VeriTest Steeplechase Battery test.² In fact, the Dell® Latitude™ XP DX2/50 destroyed the previous 486 battery life record by almost 5 hours.

New record

Dell Latitude XP 50MHz STN
Steeplechase: 17 hours, 5 minutes

Typical VeriTest Steeplechase Results
[Testing with power management. Actual battery life will vary with configuration and use.]

NEW RECORDS:	hrs:mins
Dell Latitude XP DX2/50 STN	17:05
Dell Latitude XP DX4/75 STN	16:01
Dell Latitude XP DX4/100 TFT	14:48
Dell Latitude, 2 NiMH batteries DX2/50 STN	12:15

OLD RECORD FOR 486 MONO:	12:07
IBM ThinkPad 350C (SL/25) passive	8:50
IBM ThinkPad 500 (486/slc) mono	6:30
Toshiba T4800ct (DX4/75) TFT	5:30
IBM ThinkPad 755Cs (DX4/75) passive	5:00
Compaq Contura 4/25c (SL/25) passive	4:32

The industry's only **Smart Lithium ion battery** with a built-in microprocessor can give you 8 hours of use, without adding weight.

Latitude XP's **Smart CPU** dynamically adjusts energy consumption to the specific software application being used.

Our unique and easy-to-use **Power Management software**, along with the latest in high performance and low power components, gives you longer battery life.



DELL LATITUDE i486 SX 33MHz SYSTEM

\$1999

BUSINESS LEASE³: \$74/MO.

- 9.5" DUAL SCAN STN COLOR
 - 4MB RAM (20MB MAX RAM)
 - 200MB HARD DRIVE
 - \$99 SECOND NiMH BATTERY FOR 8 HOURS
 - 1-YEAR WARRANTY*
 - 30-DAY MONEY-BACK GUARANTEE*
- ORDER CODE #600009

DELL LATITUDE INTELDX2 50MHz SYSTEM

\$2499

BUSINESS LEASE³: \$92/MO.

- 9.5" DUAL SCAN STN COLOR
 - 4MB RAM (20MB MAX RAM)
 - 340MB HARD DRIVE
 - \$99 SECOND NiMH BATTERY FOR 8 HOURS
 - 1-YEAR WARRANTY
 - 30-DAY MONEY-BACK GUARANTEE*
- ORDER CODE #600010

DELL LATITUDE INTELDX2 50MHz SYSTEM

\$2999

BUSINESS LEASE³: \$111/MO.

- 9.5" ACTIVE MATRIX TFT COLOR
 - 4MB RAM (20MB MAX RAM)
 - 200MB HARD DRIVE
 - \$99 SECOND NiMH BATTERY FOR 8 HOURS
 - 1-YEAR WARRANTY
 - 30-DAY MONEY-BACK GUARANTEE*
- ORDER CODE #600019



So you've come down here to find out about this Steeplechase thing. Well, it's not a horse race, but a thorough test of battery life. The Steeplechase test includes mechanical typing, pausing, task switching and printing in MS Windows v3.1, MS Word for Windows v6.0 and MS Excel v5.0. All numbers represent an average of at least two trials with power management function enabled. Test simulates executive usage, i.e. carrying notebook between meetings and intermittent use. Competitor's times are published in Portable Computing Magazine. For a complete copy of the VeriTest results, call our TechFaxSM line at 800-950-1324. Latitude XP is powered by one Lithium Ion battery. Latitude is powered by two NiMH batteries with the option of replacing the top battery with a second NiMH battery (required for shipping of battery only) which will increase the weight to the Latitude XP's 5 lbs. *This 3-year Limited Warranty consists of Dell's standard return-to-factory warranty, during the first year, plus 4 years of next-business-day on-site service provided by Banelec Service Corporation during the first year, plus a 2-year parts-and-labor contract for years 2 & 3. **Warranties available in the USA only for registered owners of Dell systems. For a complete copy, please call our TechFaxSM line at 1-800-950-1324 or write Dell USA L.P., 9505 Arboretum Blvd., Austin, TX 78759-2299. Attention: Guarantees. *Price varies by configuration. Prices and specifications subject to change without notice. **Business leasing arranged by Leasing Corporation. The Intel Inside logo is a registered trademark and Intel DX2 and Intel DX4 are trademarks of Intel Corporation. Dell disclaims proprietary interest in the marks and names of others. ©1994 Dell Computer Corporation. All rights reserved.

Know it all.

When it comes to useful computer information, you *can* know it all. Only Computer Select gets it to you with speed. With convenience. And with updates every month. Subscribe now and get one month FREE!

GET: Over 160 publications, 72,000 product specs and 13,000 company profiles. All the reviews and in-depth product information you'll need to help select — and justify — every purchase.

SAVE: Time and money. Put the entire computer marketplace right at your desktop, saving you hours of research so you can make the right decision in record time.

LEARN: Everything there is to know about the players in the industry. Monitor your competitor's products and business strategies; keep an eye on clients, prospects and vendors.

FIND: The opinions that count. Learn what the installed base of users and experts think about the products you're considering.

COMPARE: New products before buying. Determine whether products are compatible with your current equipment and systems.

COMPUTER SELECT

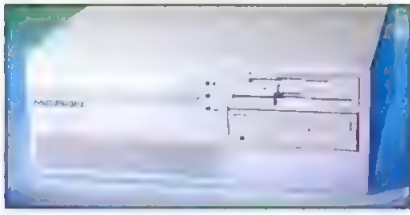
ONE MONTH FREE! CALL 1-800-827-7889

With Computer Select you'll have timely access to information about the industry that's always changing! The friendly search-and-retrieve software lets you search a comprehensive and complete data set to find the answers to your questions quickly and easily. Hidden gems of knowledge become accessible fast so you can make the right decisions in record time. Be a Know-It-All. Call 1-800-827-7889.

COMPUTER
LIBRARY

*Offer good in the U.S. and Canada only. © 1994 Ziff Communications Company. Outside the U.S. and Canada call: 1-212-503-4425.

CIRCLE 158 ON READER SERVICE CARD



► FACT FILE

Micron P90PCI PowerStation

List price: \$3,999. **Processor/Memory:** Pentium/90, 32MB RAM, 256K external cache. **Data storage:** Conner 541MB IDE hard disk, integrated PCI disk controller, Mitsumi CRM-CF001D CD-ROM drive.

Display: Matrox Ultima PCI video controller card with 2MB VRAM, Micron 17FGX 17-inch

monitor with a 61-Hz refresh rate at 1,024-by-768.

Software: DOS 6.21, Microsoft Windows for

Workgroups 3.11.

Micron Computer Inc., 800-388-6334, 208-465-3434; fax, 208-465-3424.

489 on reader service card

SUITABILITY TO TASK	
Windows applications	EXCELLENT
DOS applications	FAIR
Expandability	GOOD
VENDOR SERVICE & RELIABILITY	
Reliability	ABOVE AVERAGE
Repair service	ABOVE AVERAGE
Technical support	ABOVE AVERAGE

The Micron P90PCI turned in above-average performance on our Windows-based benchmark tests. Using a 541MB Conner IDE hard disk, the test system garnered a Disk WinMark score that was among the best of the group. Its Graphics WinMark score was high as well, thanks in part to the unit's Matrox video card.

The system's DOSmark performance was much less impressive—also because of the Matrox video card, which has never been a strong DOS performer. In fact, the Micron P90PCI's DOS video score was among the lowest of the tested systems.

Micron builds solid computers because of consistent design, and the Micron P90PCI PowerStation is no exception. Internally, it is well-thought-out and stocked with quality components, as reflected by its performance on our tests.—WPF

Mitsuba Corp.

• Mitsuba Premier System-90

Mitsuba Corp. markets its \$3,995 Mitsuba Premier System-90 as a high-end file server, or as a machine suited for networking applications, CAD/CAM, or imaging. The system's performance on disk-inten-

sive tests was strong, but it lagged in the video department.

The Mitsuba Premier uses a proprietary motherboard, based on an OPTi chip set. This desktop system—also available in mini-tower and tower configurations—has adequate room for expansion, with four 16-bit ISA slots (two with VL-Bus extensions), and three PCI slots (one of which is shared with an 8-bit ISA slot). All of the slots are easily accessible.

On our benchmark tests, the test unit turned in above-average DOS disk, DOSmark, and Disk WinMark scores. But on the downside, this system, which used BCM Advanced Research's Tseng-based P49 PCI video board with 1MB video RAM, posted a DOS video score that was below average and a Graphics WinMark score that was near the bottom of this group of 40 systems. The system's Winstone score was slightly below average; its processor score was about average.

Mitsuba's system has some welcome features, such as a Creative Labs SoundBlaster 16 audio card and motherboard integration. Its poor graphics performance may disqualify it for some applications; on the other hand, its better-than-average hard disk performance makes it attractive for others.—CV



► FACT FILE

Mitsuba Premier System-90

List price: \$3,995. **Processor/Memory:** Pentium/90, 32MB RAM, 256K external cache. **Data storage:**

Quantum 525MB IDE hard disk, integrated disk controller, Toshiba XM-4101B CD-ROM drive. **Display:** BCM Advanced Research P49 PCI video controller card with 1MB VRAM, Mitsuba M15VS 15-inch monitor with a 72-Hz refresh rate at 1,024-by-768. **Sound card:** Creative Labs SoundBlaster 16 with CD-ROM support.

Software: DOS 6.21, Microsoft Windows for Workgroups 3.11.

Mitsuba Corp., 800-648-7822 (800-MITSUBA), 909-392-2000; fax, 909-392-2021.

470 on reader service card

SUITABILITY TO TASK	
Windows applications	GOOD
DOS applications	GOOD
Expandability	EXCELLENT

NETis Technology

• NETis N590 Pentium System

When last we looked at a Pentium PC from NETis Technology (April 12, 1994), it performed well and was priced competitively. This time, NETis's entry, which is



► FACT FILE

NETis N590 Pentium System

List price: \$3,750. **Processor/Memory:** Pentium/90, 16MB RAM, 512K external cache. **Data storage:**

Maxtor 540MB SCSI-2 hard disk, Adaptec PCI disk controller card, Toshiba 3401B CD-ROM drive.

Display: ATI Mach 64 PCI video controller card with 2MB VRAM, ETC ViewMagic 1565 CPL 15-inch monitor with a 72-Hz refresh rate at 1,024-by-768. **Software:**

DOS 6.21, Microsoft Windows 3.11.

NETis Technology Inc., 800-577-8760, 408-263-0368; fax, 408-263-4624.

471 on reader service card

SUITABILITY TO TASK	
Windows applications	GOOD
DOS applications	GOOD
Expandability	GOOD

the \$3,750 NETis N590 Pentium System, is again priced on a par with other systems in the roundup. But when compared more closely with these other units, the NETis N590's performance and integration weren't impressive.

The NETis N590 is a standard desktop unit based on a Super Micro motherboard, which offers both VL-Bus and PCI expansion slots. The unit has some room for expansion, with three PCI slots and four ISA slots (two of these with VL-Bus extensions), plus one shared ISA/PCI slot. But the NETis N590 suffers from a lack of integration: The two floppy disk drives are separate, leaving only one bay open for future expansion. Since the motherboard doesn't support either an integrated floppy disk drive controller or an I/O controller, each controller card takes up one ISA slot. Also, NETis runs the 25-pin serial port through the back of the adjoining ISA slot, making this slot unusable. As it turns out, two PCI slots and one VL-Bus slot are free.

SUMMARY OF FEATURES

CONTINUES

Products listed in alphabetical order

■ = YES □ = NO

	Mega Impact P90PCI/VLB+	Memorex Telex Colorline LP90	MicroFLEX- VL/Pentium/90	Micron P90PCI PowerStation	Mitsuba Premier System-90
List price (tested configuration)	\$3,825	\$6,263	\$2,999	\$3,999	\$3,995
Processor type and speed	Pentium/90	Pentium/90	Pentium/90	Pentium/90	Pentium/90
Hard disk capacity and interface	519MB SCSI-2	522MB IDE	541MB IDE	527MB IDE	525MB IDE
Dealers/Direct-distribution channel	■ ■	□ ■	□ ■	□ ■	■ □
Case style	Desktop	Slimline	Tower	Desktop	Desktop
Power supply (and number of connectors)	250W (5)	145W (5)	250W (8)	230W (5)	200W (5)
DOS, Microsoft Windows version	DOS 6.2, Windows 3.1	DOS 6.2, Windows for Workgroups 3.11	DOS 6.21, Windows 3.1	DOS 6.21, Windows for Workgroups 3.11	DOS 6.21, Windows for Workgroups 3.11
Warranty	1 year	1 year	2 years	1 year	2 years
On-site service charge	N/A	Included (1 year)	\$50.00 (1 year)	Included (1 year)	\$40.00 (1 year)
Processor and Memory					
Bus architecture (primary)	ISA	ISA	ISA	ISA	ISA
Bus architecture (secondary)	PCI and VLB-Bus	PCI	VL-Bus	PCI	PCI and VLB-Bus
Motherboard manufacturer	Super Micro	Intel	Micro Express	Micronics	Mitsuba Corp.
Chip set manufacturer	OPTi	Intel	OPTi	Intel	OPTi
Processor upgrade path	ZIF	ZIF	ZIF	ZIF	ZIF
BIOS version (or date)	AMI (12/15/93)	AMI (5/2/94)	AMI (11/11/92)	Phoenix (4/12/94)	AMI (12/15/93)
Flash BIOS/16550 UART support	■ □	■ ■	■ □	■ ■	■ □
Installable system RAM	4MB-128MB	1MB-128MB	4MB-128MB	8MB-192MB	4MB-128MB
External RAM cache	256K-512K	256K	256K-1MB	256K-512K	256K-1MB
Cache architecture	Direct-mapped	Direct-mapped	Direct-mapped	Direct-mapped	Four-way set-associative
Cache write design	Write-back	Write-back	Write-back	Write-back	Write-back
Components					
Available hard disk sizes	340MB-8GB	200MB-1GB	300MB-2.8GB	420MB-2GB	525MB-2.1GB
Disk controller location	PCI card	Motherboard	ISA card	Motherboard	Motherboard
Accessible drive bays (5.25", 3.5")	2, 1	2, 1	3, 2	3, 0	3, 2
Internal drive bays (5.25", 3.5")	2, 2	0, 1	4, 3	0, 2	3, 3
Floppy disk drives	1.44MB	1.44MB	1.44MB	Dual 1.2MB/ 1.44MB	Dual 1.2MB/ 1.44MB
CD-ROM drive	Sony CDU-33A-01	NEC 3X1	Sony CDU-33A-01	Mitsumi CRMCFX001D	Toshiba XM-4101B
ISA, EISA, MCA slots	3, 0, 0	3, 0, 0	5, 0, 0	5, 0, 0	3, 0, 0
VL-Bus, PCI, proprietary local-bus slots	2, 4, 0	0, 2, 0	3, 0, 0	0, 3, 0	2, 3, 0
Parallel, serial, mouse ports	1, 2, 0	1, 2, 1	1, 2, 0	1, 2, 0	1, 2, 0
Display circuitry location	PCI card	PCI card	ISA card	ISA card	PCI card
Video chip set manufacturer	ATI	Matrox	ATI	Matrox	Tseng
Video RAM	2MB-4MB	2MB	1MB-2MB	2MB	1MB-2MB

N/A—Not applicable. The product does not have this feature.

On our benchmark tests, most of the system's scores were below average; its scores on the DOS video and Disk WinMark tests were significantly below average. Although the test system used an ATI Mach 64 graphics card with 2MB of VRAM—the same card found in some of the top video performers in this roundup—performance lagged because of the system's OPTi core-logic chip set. The NETiS N590's Graphics WinMark, DOSmark, DOS disk, and Graphics WinDisk test scores all clustered near the average.

The NETiS N590 Pentium System offers the flexibility of dual local buses—but not without a price: namely, poor performance and uninspired design.—CV

Novacor Inc.

● Novacor Nova Pentium 90

Two features of the Novacor Nova Pentium 90, from Novacor, immediately stand out: its huge tower case and its relatively low price of \$2,950, which is one of the lowest in this review. But dig a little deeper, and you'll find that this Utopian image becomes a bit tarnished. This system's performance on our Windows-based tests was poor, and its lack of integration does not let you take full advantage of the expansion potential inherent in a tower case.

The Novacor Nova's case provides more than adequate expansion space for

FACT FILE

Novacor Nova Pentium 90

List price: \$2,950.

Processor/Memory:

Pentium/90, 16MB RAM, 256K external cache.

Data storage:

Western Digital 340MB IDE hard disk, integrated PCI disk controller, Panasonic CR-562-B CD-ROM drive.

Display:

Cardex Challenger Pro PCI video controller card with 2MB DRAM, Arche 217MX 17-inch monitor with a 70-Hz refresh rate at 1,024-by-

768.

Software:

DOS 6.2, Microsoft Windows 3.1.

Novacor Inc., 800-486-6882, 408-441-6500; fax, 408-441-6811.

472 on reader service card


SUITABILITY TO TASK
Windows applications **FAIR**DOS applications **GOOD**Expandability **FAIR**

the typical user, with four front-accessible drive bays and five internal bays. This unit also has four SIMM sockets, but three of them are blocked by the drive bay assembly, so you'll have to remove it to expand memory. System memory is expandable to 128MB using 32MB SIMMs.

For further expansion, this system's Intel motherboard has four ISA slots, two PCI slots, and one shared ISA/PCI slot. I/O functions are integrated on the motherboard, but cables run across two of the ISA slots, then out the back, so these two ISA slots are not usable.

On our Windows-based performance tests, all of this unit's scores were below average. Its Graphics WinMark score was below average, although it was the highest score turned in by units using graphics cards based on Tseng chip sets. Under DOS, this system's video score was above average, as was its DOSmark score. Its processor score was about average, but its disk performance was far below the test group average.

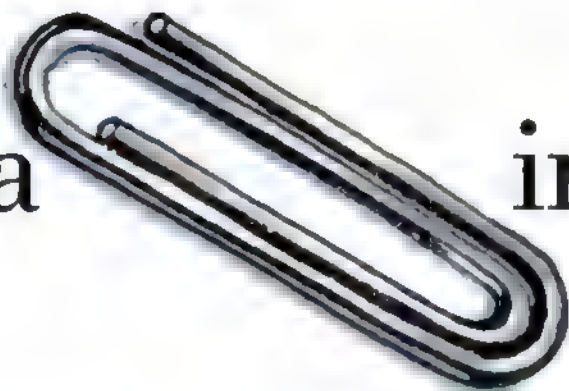
Although the Novacor Nova Pentium 90 is priced for value, the tradeoff for this low price is evident in terms of performance. Buyers interested in Pentium/90 PCs will most probably be looking for strong Windows performers; this unit is not one. Novacor offers a one-year parts-and-labor warranty with the system.—CV

There's



on the keyboard,

there's a



in the printer,

there's



in the A: drive,

there's an



on the front,

there's only one way to fix it good as new.

Whether it's a mouse or a mainframe, the parts you fix it with should be the same kind we made it with—high-quality, rigidly tested, warrantied IBM parts.

We have a full range of parts for all IBM products, including older systems like PC/XTs™ and System/36s, and you

can get exchange prices on selected items.

What's more, IBM parts are always available, and so are we. You can call us toll free 24 hours a day, 7



days a week for orders or price quotes, and, yes, we'll be happy to accept your Visa, MasterCard or American Express.

IBM PARTS

For orders or price quotes call anytime:

1 800 388-7080



Data Protection For People Who'd Rather Not Think About It.

With Conner's Tape•Stor™ 250 automatically backing up your data, you won't have to give data protection a second thought. In fact, a current backup is your best protection against accidental data loss.



Tape•Stor 250 MB Internal
Tape Backup System

Tape•Stor 250 systems are available in internal and parallel port models—both of which are compatible with QIC-80 and AccuTrak 250 industry standards. And when it comes to ease of installation, our tape backup systems are complete with everything you need including mounting hardware and cables.

Daily or weekly backup is easy using Conner's Backup Basics™, a simple two button software program included with the Tape•Stor 250. Plus, we back our drives with a two-year warranty. That's twice the competition's warranty. And as always, Conner tape drives are supported by toll-free technical support.

So call 1-800-6-CONNER for more information about Conner's Tape•Stor 250. But call now...and you won't have to think about it a second longer.

Feature	Conner Tape•Stor 250 MB	Colorado Memory Systems Jumbo 250 MB
MTBF	100,000 hours	40,000 hours
QIC & AccuTrak	Total Compatibility	No AccuTrak Compatibility
Warranty	2 years	1 year

CONNER
The Storage Answer.

Pactron Integration Computer Inc.

● Pactron Quake 9NSX90

Pactron Integration Computer's \$3,500 Pactron Quake 9NSX90 attempts to cover all the bases by offering both PCI and VL-Bus expansion slots in a spacious tower case. Nevertheless, the product comes up a bit short on performance.

The Pactron Quake offers three ISA slots (in the tested unit, one was filled with an 8-bit CD-ROM interface), three PCI slots (one was filled with a Diamond Viper PCI graphics card), and two VL-Bus slots (one was occupied with a multi-function I/O and disk controller card). There is also one shared ISA/PCI slot.

The Pactron Quake's hefty metal tower case (complete with wheels) offers more than ample space for additional devices, with a total of 11 drive bays (5 front accessible and 6 internal). One of these is taken by the system's Quantum 540MB hard disk and another by the double-speed Sony CD-ROM drive. Most motherboard components and SIMM slots are easily accessible.

As with many of the dual-local-bus machines in this roundup, the OPTi chip set introduced delays that ultimately weakened the unit's test scores. The Pactron Quake's Winstone, Graphics WinMark,

Disk WinMark, DOSmark, processor, and DOS video scores were among the bottom five on each of our tests, and its DOS disk score was in the bottom quartile.

With other similarly configured machines offering better performance, the Pactron Quake 9NSX90's only standout feature is its expandability. Pactron Integration Computer offers a two-year parts-and-labor warranty.—RSA

Polywell Computers Inc.

● Polywell Poly 586-90VLB

The \$3,500 Polywell Poly 586-90VLB offers average to above-average performance and a longer warranty than most systems in this roundup. If you're looking for flexibility and power, you might want

troller card. Another was taken by the CD-ROM drive controller card. One of the VL-Bus slots was taken by the floppy/hard disk controller, another by the video controller.

The Polywell Poly did well on a number of our tests, though its performance was somewhat better under DOS than Windows. It achieved average scores on the Winstone, Graphics WinMark, and processor tests. This unit's one bright spot on our Windows-based tests was in disk performance: The Maxtor hard disk, along with a Tekram controller with 4MB of cache, helped the unit achieve an average score on the Disk WinMark tests. The unit also garnered an above-average score on the DOS disk tests. The system's Actix graphics card with 2MB of video RAM boosted the Polywell Poly's score on the DOS video tests to above average.

The Polywell Poly comes with a two-year warranty on parts and a five-year warranty on labor.—AY

Royal Electronic Inc.

● Royal Media Master IV

Royal Electronic's \$3,995 Royal Media Master IV has much to offer. It achieved above-average graphics performance, incorporates quality peripherals, and can

► FACT FILE

Pactron Quake 9NSX90

List price: \$3,500 **Processor/Memory:** Pentium/90, 16MB RAM, 256K external cache.

Data storage: Quantum 540MB IDE hard disk, VL-Bus disk controller card, Sony CDU-33A-01 CD-ROM drive.

Display: Diamond Viper PCI graphics controller card with 2MB VRAM, MGC XGA 15-inch monitor with a 72-Hz refresh rate at 1,024-by-768. **Software:** DOS 6.2, Microsoft Windows 3.1.



SUITABILITY TO TASK

Windows applications	FAIR
DOS applications	FAIR
Expandability	EXCELLENT

Pactron Integration Computer Inc.; 800-775-8766, 818-700-1259; fax, 818-700-1303.

473 on reader service card

► FACT FILE

Polywell Poly 586-90VLB

List price: \$3,500.

Processor/Memory:

Pentium/90, 16MB RAM, 512K external cache. **Data storage:** Maxtor 540MB IDE hard disk, Tekram DC-680 VL-Bus disk controller card with 4MB cache, Philips 562 CD-ROM drive. **Display:** Actix GraphicsEngine VL 64 VL-Bus video controller card with 2MB DRAM, Sampo KDM-1566 15-inch monitor with a 72-Hz refresh rate at 1,024-by-768. **Software:** DOS 6.21, Microsoft Windows 3.11, The Chessmaster 2100, F-29, Might & Magic II, Paperboy 2.0, Push-over, Robocop 3D.

Polywell Computers Inc., 800-999-1278, 415-583-7222; fax, 415-583-1974.

474 on reader service card



SUITABILITY TO TASK

Windows applications	GOOD
DOS applications	EXCELLENT
Expandability	GOOD

to consider this machine.

The Polywell Poly comes in a mini-tower case with five front-accessible bays and three internal bays. In our test machine, two internal and three front-accessible bays were still free.

This system has eight ISA slots, three with VL-Bus extensions. The Polywell Poly is one of few systems in this review that supports only VL-Bus, not VL-Bus and PCI. Since I/O ports are not integrated, one ISA slot was taken by the I/O con-

► FACT FILE

Royal Media Master IV

List price: \$3,995.

Processor/Memory:

Pentium/90, 16MB RAM, 256K external cache. **Data storage:** Quantum 515MB SCSI-2 hard disk with 256K cache, Assus SC200 PCI disk controller card, NEC CDR-510 CD-ROM drive. **Display:** ATI Graphics ProTurbo 64 PCI video controller card with 2MB VRAM, KFC CA 1507 15-inch monitor with a 70-Hz refresh rate at 1,024-by-768. **Sound card:** Orchid SoundWave 32.

Software: DOS 6.2, Microsoft Windows for Workgroups 3.11.

Royal Electronic Inc.; 800-486-0008, 818-855-5077; fax, 818-330-2717.

475 on reader service card



SUITABILITY TO TASK

Windows applications	EXCELLENT
DOS applications	GOOD
Expandability	EXCELLENT

► SUMMARY OF FEATURES

CONTINUES

Products listed in alphabetical order
■ = YES □ = NO

	NETIS N590 Pentium System	Novacor Nova Pentium 90	Pactren Quake 9MSX90	Polywell Poly 506-00VLB	Royal Media Master IV
List price (tested configuration)	\$3,750	\$2,950	\$3,500	\$3,500	\$3,995
Processor type and speed	Pentium/90	Pentium/90	Pentium/90	Pentium/90	Pentium/90
Hard disk capacity and interface	540MB SCSI-2	340MB IDE	540MB IDE	540MB IDE	515MB SCSI-2
Dealers/Direct-distribution channel	□ ■	■ ■	■ ■	□ ■	□ ■
Case style	Desktop	Tower	Tower	Mini-tower	Tower
Power supply (and number of connectors)	250W (5)	250W (6)	300W (6)	230W (7)	250W (7)
DOS, Microsoft Windows version	DOS 6.21, Windows 3.11	DOS 6.2, Windows 3.1	DOS 6.2, Windows 3.1	DOS 6.21, Windows 3.11	DOS 6.2, Windows for Workgroups 3.11
Warranty	1 year	1 year	2 years	2 years parts, 5 years labor	1 year parts, lifetime labor
On-site service charge	\$150.00 (1 year)	N/A	\$150.00 (1 year)	\$75.00 (1 year)	\$50.00 (1 year)
Processor and Memory					
Bus architecture (primary)	ISA	ISA	ISA	ISA	ISA
Bus architecture (secondary)	PCI and VL-Bus	PCI	PCI and VL-Bus	VL-Bus	PCI
Motherboard manufacturer	Super Micro	Intel/Digicom	Super Micro	TM Corp.	Super Micro
Chip set manufacturer	OPTi	Intel/Digicom	OPTi	OPTi	Intel
Processor upgrade path	ZIF	ZIF	Standard socket	ZIF	ZIF
BIOS version (or date)	AMI (5/2/94)	AMI 1.00.03.AXIZ	AMI (12/15/93)	AMI (3/1/94)	Award (5/11/94)
Flash BIOS/16550 UART support	■ ■	■ ■	■ ■	■ ■	■ □
Installable system RAM	2MB-128MB	2MB-128MB	2MB-128MB	8MB-128MB	4MB-128MB
External RAM cache	128K-512K	0-256K	256K-512K	256K-512K	256K-512K
Cache architecture	Direct-mapped	Four-way set-associative	Two-way set-associative	Direct-mapped	Direct-mapped
Cache write design	Write-back	Write-back	Write-through	Write-back	Write-back
Components					
Available hard disk sizes	200MB-2GB	340MB-1.2GB	120MB-4GB	420MB-9GB	515MB-2GB
Disk controller location	PCI card	Motherboard (PCI)	VL-Bus card	VL-Bus card	PCI card
Accessible drive bays (5.25", 3.5")	3, 2	4, 0	5, 0	3, 2	6, 0
Internal drive bays (5.25", 3.5")	0, 2	2, 3	8, 0	0, 3	0, 5
Floppy disk drives	1.2MB, 1.44MB	1.2MB, 1.44MB	1.44MB	1.44MB	1.44MB
CD-ROM drive	Toshiba 3401B	Panasonic CR-562-B	Sony CDU-33A	Philips 562	NEC CDR510
ISA, EISA, MCA slots	3, 0, 0	5, 0, 0	5, 0, 0	5, 0, 0	4, 0, 0
VL-Bus, PCI, proprietary local-bus slots	2, 4, 0	0, 0, 0	2, 4, 0	3, 0, 0	0, 4, 0
Parallel, serial, mouse ports	1, 2, 0	1, 2, 0	1, 2, 1	1, 2, 0	1, 2, 0
Display circuitry location	PCI card	Motherboard (PCI)	PCI card	VL-Bus card	PCI card
Video chip set manufacturer	ATI	Tseng	Weitek	S3	ATI
Video RAM	1MB-2MB	1MB-2MB	1MB-2MB	1MB-4MB	2MB-4MB

N/A—Not applicable. The product does not have this feature.

support a second Pentium processor. This combination should satisfy most users—especially those who need to run high-end Windows graphics software.

The unit we tested was housed in a tower case that included a triple-speed NEC CDR-510 CD-ROM drive and an Orchid SoundWave 32 sound card. The cramped motherboard included two ZIF sockets for dual-processor support.

The Royal Media Master has three EISA slots, three PCI slots, and one shared EISA/PCI slot. In the unit we tested, one of the PCI slots was occupied by an ATI Graphics ProTurbo 64 PCI card with 2MB of VRAM and another by an Asus SC200 PCI SCSI controller. The lat-

ter component was connected to the CD-ROM drive and the 515MB Quantum SCSI hard disk. One EISA slot was occupied by a sound card, another by an I/O card. The tower case had eight free bays.

The Royal Media Master's strong point is graphics performance: Its Graphics WinMark score ranked seventh, and its DOS video score was also above average. Scores on our other Windows-based tests were on a par with those garnered by the other systems: The system's Winstone and Disk WinMark scores were average. The processor and DOS disk scores were average, and the DOSmark score was above average.

The Royal Media Master comes with a

one year warranty on parts and a lifetime warranty on labor.—*Daniel A. Begun*

Sidus Systems Inc.

• Sidus SCI9P590PDT

The \$3,559 Sidus SCI9P590PDT offers good Windows performance at a reasonable price. But the Sidus SCI9P590PDT has limited expansion potential because of poor internal design.

Sidus Systems avoided some common pitfalls by not overcrowding the Sidus SCI9P590PDT's Micronics motherboard or blocking access to unused slots with other boards and components. The system had three ISA slots, one PCI slot, and one shared ISA/PCI slot free. But the unit still has limited expansion potential, since only two drive bays were open, and both were blocked by the installed drives.

In the Windows arena, the Sidus SCI9P590PDT proved to be a generally above-average performer. The Winstone score was above average. The Disk WinMark score was also above average, partly due to the strength of the unit's Conner hard disk. The hard disk also helped the system perform well on the DOS disk tests. The unit's video subsystem, based on a PCI Matrox MGA video card, could help the machine achieve only an average



► FACT FILE

Sidus SCI9P590PDT

List price: \$3,559. **Processor/Memory:** Pentium/90, 16MB RAM, 256K external cache. **Data storage:** Conner 810MB IDE hard disk, integrated PCI disk controller, Sony CDU-33A-01 CD-ROM drive. **Display:** Matrox MGA-2/2MB-PCI PCI video controller card with 2MB DRAM, Mitsubishi Electronics Diamond Scan 15FS 15-inch monitor with a 76-Hz refresh rate at 1,024-by-768. **Software:** DOS 6.21.

Microsoft Windows for Workgroups 3.11.

Sidus Systems Inc.; 800-856-3667, 415-461-6732; fax, 415-461-7526.

476 on reader service card

SUITABILITY TO TASK

Windows applications	EXCELLENT
DOS applications	FAIR
Expandability	GOOD

COVER STORY
90-MHz Pentium PCs

Graphics WinMark score.

On the remaining DOS-based tests, the Sidus SCI9P590PDT generally performed poorly. The processor score was average, but the system's video score was the lowest in this roundup (unsurprising given the Matrox card). This in turn brought the DOSmark score to well below average.

The Sidus SCI9P590PDT is a solid Windows performer, but its limited expansion potential is a drawback.

The Sidus SCI9P590PDT comes with a one-year parts-and-labor warranty. —WPF

Solmicro Inc.

• Solmicro Arena PV190

At \$2,999, the Solmicro Arena PV190 is one of the lowest-priced systems in this roundup; it was also one of the worst performers.

The Solmicro Arena's motherboard uses an OPTi chip set to provide both VL-Bus and PCI support. Solmicro tried to take advantage of both high-speed buses: It installed a VL-Bus disk and I/O controller and went with the PCI-based ATI Mach 64 card for video. This combination produced test scores that were consistent-

ly below average—even lower than the scores of the other systems that are based on the OPTi chip set. On our Windows-based tests, the system was among this group's poorest performers. Only the CAF Lightning P9 had a lower Winstone score, and the unit's Graphics WinMark and Disk WinMark scores were both below average. On our DOS-based tests, the story was the same: The processor, video, and disk scores were below average, which contributed to the system's low DOSmark score.

The Solmicro Arena is a network-ready system whose tower case leaves plenty of room for expansion. The system had two front-accessible and two internal drive bays free, plus four open expansion slots. One ISA slot was occupied by a 3COM Etherlink card, which the company says it provides because most Solmicro Arena buyers are already in a networked environment. The card adds roughly \$150 to the price of the system—meaning that without it, the Solmicro Arena would be the least expensive system in this roundup. But a rock-bottom price can't compensate for the unit's unimpressive performance, which was barely better than many of the 60-MHz Pentium systems we've seen.

The Solmicro Arena comes with a one-year standard warranty; on-site service is \$79 per year. —WPF

Sys Technology Inc.

EDITORS' CHOICE Sys Performance Pentium 90 Full Tower

The Sys Performance Pentium 90 Full Tower succeeded in combining quality components, top-tier performance, and expandability. The result is a system that should satisfy any user's needs and, at \$3,490, still maintains a competitive price.

The Sys Performance Pentium is housed in a tower case. Its configuration left three front-accessible and three internal bays free. The system also has a total of three ISA and three PCI slots, plus one shared ISA/PCI slot. One PCI slot was occupied by an ATI Graphics ProTurbo 64 PCI card with 4MB of VRAM. Another PCI slot contained a BusLogic BT-910A IDE PCI Caching Controller with 8MB of RAM, which was connected to a 976MB Micropolis 2210A IDE hard

disk. One of the ISA slots was occupied by an I/O card and another by a SCSI controller card for the Toshiba XM-3401B CD-ROM drive.

The Sys Performance Pentium's Windows performance was exceptional. It garnered the best Winstone score in this roundup and strong Graphics WinMark

► FACT FILE

Sys Performance Pentium 90 Full Tower

List price: \$3,490. **Processor/Memory:** Pentium/90, 16MB RAM, 512K external cache.

Data storage: Micropolis 2210A 976MB IDE hard disk, BusLogic BT-910A IDE PCI disk controller card with 8MB cache, Toshiba XM-3401B CD-ROM drive.

Display: ATI Graphics ProTurbo 64 PCI graphics card with 4MB VRAM, KFC CA 1507 15-inch monitor with a 70-Hz refresh rate at 1,024-by-768. **Software:** DOS 6.21, Microsoft Windows for Workgroups 3.11.

Sys Technology Inc.; 310-493-6888; fax, 310-493-2816.
477 on reader service card



SUITABILITY TO TASK

Windows applications	EXCELLENT
DOS applications	EXCELLENT
Expandability	GOOD

► FACT FILE

Solmicro Arena PV190

List price: \$2,999.

Processor/Memory: Pentium/90, 16MB RAM, 512K external cache.

Data storage: Maxtor 540MB IDE hard disk with 256K cache, QDI VL-Bus disk controller card, Chinon CDS-535 CD-ROM drive. **Display:** ATI Mach 64 PCI video controller card with 2MB VRAM, Viewsonic 15 15-inch monitor with a 76-Hz refresh rate at 1,024-by-768. **Sound card:** Creative Labs Sound Blaster.

Network interface: 3COM-3C509 Etherlink Ethernet adapter. **Software:** DOS 6.2, Microsoft Windows 3.11.

Solmicro Inc.; 800-523-7501, 510-656-5440; fax, 510-438-0491.

477 on reader service card



SUITABILITY TO TASK

Windows applications	GOOD
DOS applications	FAIR
Expandability	GOOD

and Disk WinMark scores.

The Sys Performance Pentium also achieved the highest DOS disk score. This score, along with the fifth-highest processor score and an above-average DOS video score, helped give the system a top-ten DOSmark score.

The Sys Performance Pentium stands out for its excellent performance, low price, and features. —DAB

Tagram System Corp.

• Tagram Thunderbolt P90 • Tagram Thunderbolt PCI 90

Tagram System Corp. submitted two well-built machines to this roundup. Both are competitive performers and are affordably priced: The Tagram Thunderbolt P90 costs \$2,999, and the Tagram Thunderbolt PCI 90 costs \$3,119. The Tagram Thunderbolt P90 provides a VL-

Good news.

Fast, usable, and priced for mortals...venerable keyboard, gorgeous display, blazing speed, and unparalleled craftsmanship.

JAN. 1994 — PC COMPUTING

Toshiba adds high-end features...to low-cost notebooks

NOV. 1993 — PC WORLD

...the T1950CT combines cost effectiveness and enhanced features to meet the needs of price-conscious power users.

OCT. 1993 — MOBILE OFFICE

...an exceptional value-priced notebook for mobile professionals who are looking for speed and performance...

JAN. 1994 — PORTABLE COMPUTING

Satellite

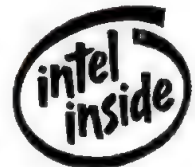


Introducing the New Satellite T1960C Series. When

Toshiba introduced the T1950 Series, the critics raved about

the high-end features, powerful i486 processor and low-end price.

Now, take a good look at the new T1960C Series — running at 50MHz, it has 25% more processing power for increasingly demanding applications. Best of all, the critically-acclaimed



©1994 Toshiba America Information Systems, Inc. The Intel Inside logo is a trademark of Intel Corporation. All products indicated by trademark symbols are trademarked and/or registered by their respective companies. ★ T1960CS, 200MB HDD. Reseller prices may differ. All prices and specifications are subject to change. Shipping, handling, and applicable sales tax not included.

More good news!



features are still here. With a choice of either vivid active matrix or eye-popping dual-scan color displays. An oversized PCMCIA slot that supports Type I, II, and III cards for unlimited expansion. And more storage capacity than ever before, with hard drives of 320MB or 200MB. But the biggest news of all? The price is still extraordinarily affordable. Call 1-800-457-7777 for a dealer near you.



In Touch with Tomorrow
TOSHIBA

\$2599*

T1960CS

- 9.5" dia. color Dynamic-STN dual-scan display
- 200MB HDD

T1960CT

- 8.4" dia. color TFT-LCD active matrix display
- 200/320MB HDD

BOTH MODELS

- i486DX2/50MHz, 3.3v
- Integrated math co-processor
- 4MB RAM expandable to 20MB
- 8KB of cache
- 14.5mm Type III PCMCIA slot
- BallPoint Mouse with QuickPort™
- NiMH battery with Toshiba MaxTime™ Power Management
- Under 7 lbs.
- Pre-installed software: MS-DOS® and Microsoft Windows™

SUMMARY OF FEATURES

CONTINUES



Products listed in alphabetical order
■ = YES □ = NO

	Sidus SC10P500PDT	Solmicro Arena PV190	Sys Performance Pentium 90 Full Tower	Tagram Thunderbolt P90	Tagram Thunderbolt PCI 90
List price (tested configuration)	\$3,420	\$2,999	\$3,490	\$2,999	\$3,119
Processor type and speed	Pentium/90	Pentium/90	Pentium/90	Pentium/90	Pentium/90
Hard disk capacity and interface	810MB IDE	540MB IDE	976MB IDE	527MB IDE	528MB IDE
Dealers/Direct-distribution channel	■ ■	□ ■	■ ■	■ ■	■ ■
Case style	Desktop	Tower	Tower	Desktop	Desktop
Power supply (and number of connectors)	200W (5)	250W (5)	300W (10)	250W (5)	250W (5)
DOS, Microsoft Windows version	DOS 6.21, Windows for Workgroups 3.11	DOS 6.2, Windows 3.11	DOS 6.21, Windows for Workgroups 3.11	DOS 6.21, Windows for Workgroups 3.11	DOS 6.21, Windows for Workgroups 3.11
Warranty	1 year	1 year	1 year	3 years	3 years
On-site service charge	Varies	\$79.00 (1 year)	N/A	\$30.00 (1 year)	\$30.00 (1 year)
Processor and Memory					
Bus architecture (primary)	ISA	ISA	ISA	ISA	ISA
Bus architecture (secondary)	PCI	PCI and VL-Bus	PCI	VL-Bus	PCI and VL-Bus
Motherboard manufacturer	Micronics	Super Micro	Giga-Byte Technology Co.	BCM Advanced Research	BCM Advanced Research
Chip set manufacturer	Intel	OPTi	Intel	Intel	OPTi
Processor upgrade path	ZIF	ZIF	ZIF	ZIF	ZIF
BIOS version (or date)	Phoenix 4.03 MS4PI-PXX	AMI (12/15/93)	Award (5/10/94)	AMI (11/11/94)	AMI (11/11/92)
Flash BIOS/16550 UART support	■ ■	■ ■	■ □	□ □	■ ■
Installable system RAM	4MB-192MB	4MB-128MB	2MB-512MB	1MB-128MB	4MB-128MB
External RAM cache	0-612K	128K-512K	256K-512K	128K-1MB	256K-1MB
Cache architecture	Direct-mapped	Direct-mapped	Direct-mapped	Two-way set-associative	Direct-mapped
Cache write design	Write-back	Write-back	Write-back	Write-back	Write-back
Components					
Available hard disk sizes	170MB-1.2GB	170MB-1GB	540MB-4GB	210MB-2GB	210MB-2GB
Disk controller location	Motherboard (PCI)	VL-Bus card	PCI card	VL-Bus card	Motherboard (PCI)
Accessible drive bays (5.25", 3.5")	2, 1	4, 0	4, 1	2, 2	2, 2
Internal drive bays (5.25", 3.5")	1, 2	2, 2	1, 3	3, 3	0, 3
Floppy disk drives	1.44MB	1.44MB	Dual 1.2MB/ 1.44MB	1.44MB	1.44MB
CD-ROM drive	Sony CDU-33A	Chiconi CDS-535	Toshiba XA-3401B	Panasonic CR-582	Panasonic CR-562
ISA, EISA, MCA slots	5, 0, 0	3, 0, 0	4, 0, 0	5, 0, 0	3, 0, 0
VL-Bus, PCI, proprietary local-bus slots	0, 2, 0	2, 4, 0	0, 4, 0	3, 0, 0	2, 3, 0
Parallel, serial, mouse ports	1, 2, 0	1, 2, 0	1, 2, 0	1, 1, 0	1, 2, 0
Display circuitry location	PCI card	PCI card	PCI card	VL-Bus card	PCI card
Video chip set manufacturer	Matrox	ATI	ATI	Tseng	Tseng
Video RAM	2MB-4MB	2MB	2MB-4MB	1MB-2MB	1MB-2MB

N/A—Not applicable: The product does not have this feature.

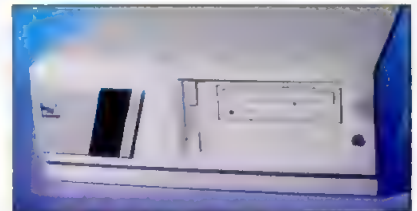
Bus slot; the Tagram Thunderbolt PCI 90 provides both VL-Bus and PCI slots, taking a slight performance hit in the bargain.

The Tagram Thunderbolt P90 had a VL-Bus-based disk controller and video card. The Tagram Thunderbolt PCI 90 attempts to cover all the bases by using a motherboard with three PCI slots and two VL-Bus slots. Tagram installed a VL-Bus-based hard disk controller and a PCI-based video card on the Tagram Thunderbolt PCI 90.

Windows performance for the Tagram Thunderbolt P90 was uneven. The system's Graphics WinMark score was well below average; its Winstone score, however, was average. This unit's 527MB

Maxtor hard disk helped it post the top Disk WinMark score in this roundup. On our DOS-based tests, the P90 system's processor score was average. The disk score was slightly below average, but its video score was above average. The latter score contributed to an above-average DOSmark score.

The Tagram Thunderbolt PCI 90 nearly mirrored the P90 system's uneven Windows performance. Its Graphics WinMark score was well below average, partly because of the performance of the Tseng Labs ET4000 W32P-based video subsystem. This machine's Winstone score was average. On the Disk WinMark tests, the Tagram Thunderbolt PCI 90 did not do



FACT FILE

Tagram Thunderbolt P90

List price: \$2,999. **Processor/Memory:** Pentium/90, 16MB RAM, 256K external cache. **Data storage:** Maxtor 527MB IDE hard disk, Appian GP-4012 VL-Bus disk controller card, Panasonic CR-562-B CD-ROM drive. **Display:** Tseng Labs ET4000 W32P video controller card with 2MB DRAM, Optquest 2000DS 15-inch monitor with a 72-Hz refresh rate at 1,024-by-768. **Software:** DOS 6.21, Microsoft Windows for Workgroups 3.11.

SUITABILITY TO TASK

Windows applications **EXCELLENT**
DOS applications **EXCELLENT**
Expandability **GOOD**

479 on reader service card

Tagram Thunderbolt PCI 90

List price: \$3,119. **Processor/Memory:** Pentium/90, 16MB RAM, 256K external cache. **Data storage:** Maxtor 528MB IDE hard disk, integrated PCI disk controller, Panasonic CR-562-B CD-ROM drive. **Display:** Tseng Labs ET4000 W32P video controller card with 2MB DRAM, Optquest 2000DX 15-inch monitor with a 72-Hz refresh rate at 1,024-by-768. **Software:** DOS 6.21, Microsoft Windows for Workgroups 3.11.

SUITABILITY TO TASK

Windows applications **GOOD**
DOS applications **GOOD**
Expandability **GOOD**

479 on reader service card

quite as well as the P90 system, placing fourth of all tested units. On our DOS-based tests, the Tagram Thunderbolt PCI 90's processor score was below average. Its DOS video score was below average, but a third-place DOS disk score pushed its DOSmark score to slightly above average.

The Tagram Thunderbolt P90 offers the better performance of the two systems, though the Tagram Thunderbolt PCI 90 offers the flexibility of both VL-Bus and PCI technologies for only \$120 more. Still, the Tagram Thunderbolt PCI 90 can't beat the Tagram Thunderbolt P90 in terms of price/performance ratio.

Both of these systems include three-year parts-and-labor warranties. Tagram offers on-site service for \$30 per year. —WPF



everything IS NEW
nothing IS THE WAY it
WAS.

it's the wake-UP CALL
for a NEW way
of WORKING.
TIME TO rise and shine.

INTRODUCING 1-2-3 RELEASE 5. NOW THE LEGENDARY SPREADSHEET BRINGS MORE PEOPLE TO THE NUMBERS AND THE NUMBERS TO LIFE.

1-2-3® has always helped individuals become more productive. Now it goes to a new realm—workgroup productivity. With strengthened ties to Lotus Notes® and new, sophisticated routing features, workgroups are using 1-2-3 Release 5 to make decisions, reach consensus and explore possibilities.

No other spreadsheet has the features of 1-2-3 Release 5. Features that make everyday spreadsheet tasks easier. Features that help you move from task to task fluidly. Maximum productivity, minimum effort.

freedom
of MOVEMENT,
NOT
chains of COMMAND.

TAP THE POWER OF NOTES WHEN
YOU'RE IN 1-2-3. TAP THE POWER OF
1-2-3 WHEN YOU'RE IN NOTES.

Say you're working on the annual budget in 1-2-3. You can save your spreadsheet in Notes. Then share ideas and information with colleagues working on the same budget at the same time.

Any changes to your spreadsheet are automatically synchronized and distributed thanks to Notes replication technology. Plus Notes' security protects the integrity of your data.



When you're working in Notes and want to crunch

numbers, prepare budgets or perform "what-if" analyses, you can launch into 1-2-3 with Notes/FX™ 1.1—to get the power of 1-2-3 right in your Notes application.

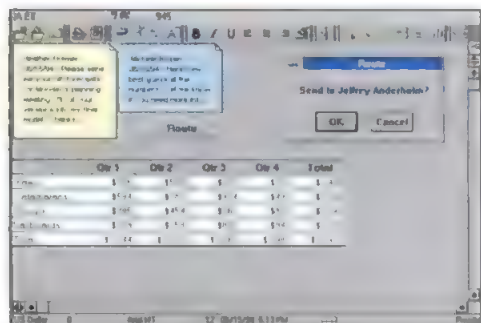
Notes/FX goes beyond OLE to provide you with a dynamic two-way exchange of key information



between Notes and 1-2-3. So you can roll that 1-2-3 information back into any Notes application.

POWERFUL WORKGROUP FEATURES EVEN WITHOUT NOTES.

1-2-3's powerful Version Manager™ lets each person in your workgroup save multiple sets of charts to any name range. So you know the who, what, when and why of every change all the time.



1-2-3's Range Routing lets you share data with colleagues—sequentially or all at once—collecting their comments and input into a single document.

Plus, unlike other spreadsheets, 1-2-3 can designate particular ranges for comment or review by particular users, rather than routing the entire worksheet. Range Routing lets you mail the spreadsheet range to workgroup members for input, track progress, then roll everyone's ideas back into your file, complete with comments and changes tracked as versions.

1-2-3 Release 5 worksheets and ranges can be routed using either VIM or MAPI based e-mail and can be routed either serially or in parallel.

MAXIMUM PRODUCTIVITY, MINIMUM EFFORT.

1-2-3 Release 5 is packed with innovative new features designed to help you get more done with less effort.

SmartMasters™ are predesigned and customizable templates of everyday business forms—like expense reports, invoices and purchase orders—with built-in intelligence to guide you through common tasks

in record time. Or create custom SmartMasters for yourself or your workgroup.

With Lotus Maps you can create instant maps of geographic data. Select a range of data and watch 1-2-3 Release 5 create the appropriate map with color-coding based on data ranges. 1-2-3 Release 5 ships with maps for the world by country, U.S. by state, Canada by province, Europe, Mexico, Japan, Taiwan and Australia.

1-2-3 Release 5 features seamless integration with Lotus Approach® database to easily create data entry forms and generate reports and mailing labels.

With Fast Format you can apply the formatting you've designed for one range to any other range in the worksheet—with one click of the mouse.

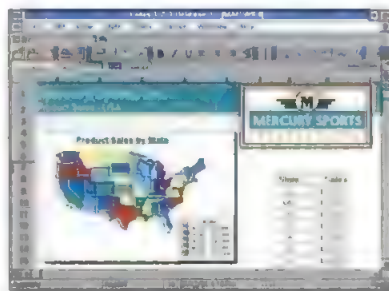
One-Step Charting lets you build a chart complete with labels, titles and legends, all in a single step.

Drag-and-Fill fills in ranges from other documents in just one step. And our improved OLE 2.0 Drag-and-Drop lets you move copy or data across worksheets or files fast.

Multi-page Print Preview lets you view up to nine spreadsheets on your screen before you print.

Taken all together, the new 1-2-3 is loaded with enhancements that make getting the job done a whole lot easier—alone or in a workgroup. And 1-2-3 Release 5 gives you the best compatibility with 1-2-3 for DOS of any spreadsheet. To learn more about 1-2-3 Release 5, visit your Lotus

Authorized Reseller or call **1-800-TRADE-UP, ext. 9969*** for a free demo disk. A 1-2-3 upgrade costs \$119.**



1-2-3 Release 5 features Lotus Maps. It's the easiest, most effective way to analyze your spreadsheet data geographically.



Lotus
Working Together™

NEW SMARTSUITE 3.0. A MAJOR RELEASE TO HELP YOU AND YOUR TEAM WORK TOGETHER.

To work better people need powerful desktop applications, built for both individual and team productivity.

SmartSuite® 3.0 is exactly that. It's the best suite for this new way of working because it's the only suite built to optimize Lotus Notes.

The applications that make up SmartSuite have been upgraded in some very important ways—so they work harder and work together better than ever.

1-2-3 Release 5 is packed with new features like SmartMasters spreadsheets templates, Lotus Maps for geographic visuals of data, Smart Assistants to guide you, seamless integration with Approach database, Range Routing for

drawing tools. Ami Pro also seamlessly imports documents from other word processors.

Freelance Graphics® 2.1 features task and industry specific SmartMasters, a unique 3-step process to create presentations, charting and drawing, presentation management and improved import/export capabilities.

And Organizer™ 1.1 offers easy linking for cross-referencing, flexible printing, group scheduling and nifty integration with Ami Pro so you can create monthly calendars in Ami Pro from Organizer appointments.

SMARTSUITE 3.0 IS A BETTER INTEGRATED SUITE ACROSS THE BOARD.

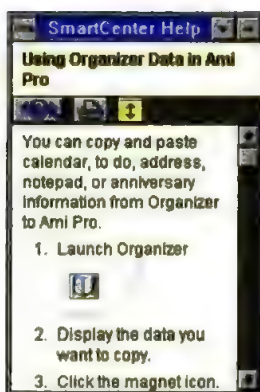
The integration in SmartSuite begins with a consistent look and feel across applications—they share a common user interface, menus, SmartIcons® and a Live Status Bar.

SmartCenter, the headquarters for cross-application services, is always there to help you switch or launch applications. You can customize its icon palette into the configuration that's most convenient for you.

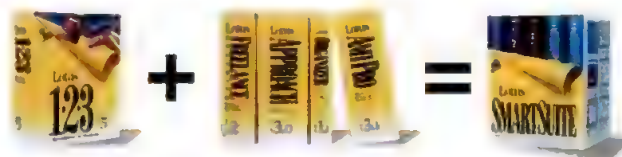
SuiteAnswers are cross-application help tools which include a SmartSuite Guided Tour and task-oriented Help Cards—plus the new ScreenCam™ for creating audio/visual "screen movies." It's the only help service in Windows™ that stays up as you move between applications.

Smart Assistants are your step-by-step guide through common tasks.

And our powerful 1-2-3/Approach database integration lets you analyze and format 1-2-3 data, taking full advantage of Approach's easy-to-use



Help Card, one of SmartSuite's powerful help tools, guides you through cross-application tasks.



mailing spreadsheet ranges, OLE 2.0 Drag and Drop, and, of course, Lotus Notes Integration.

The new Lotus Approach 3.0 offers unprecedented ease-of-use, PowerClick™ reporting, X10™ technology (our new, exclusive, speed-optimized architecture) and the easiest-to-design forms, mailing labels and cross-tabs on the market.

Ami Pro® 3.1 offers powerfully fast word processing (49% faster than Word, 103% faster than WordPerfect®), low memory/hard disk requirements (4MB RAM, 15MB for complete installation), with proofing tools, collapsible click and drag outlining, revision marking, powerful macro language and automatic list renumbering. There are over 55 predesigned style sheets for memos, faxes, reports and more. Built-in charting & in-context



SmartCenter is always there to help you launch applications or switch between them. And Bubble Help is right there for you—all you do is point.

SuiteAnswers menu





forms and reports,
dynamic crosstabs to
pivot rows and columns
and tools for creating summaries

or viewing data in several formats.

**SMARTSUITE, THE NOTESREADY
SUITE, EXTENDS THE DESKTOP
TO THE WORKGROUP.**

SmartSuite 3.0 includes powerful workgroup enhancements. But for an even higher level of workgroup capability, just add Lotus Notes and see what happens:

Combined with Lotus Notes, 1-2-3 Release 5 becomes a model management system that lets team members search a library of worksheets.

Add Notes to Ami Pro 3.1 and it becomes a real "workgroup processor." Use the built-in Notes database for efficient, secure document sharing and tracking. And you can format your Notes or cc:Mail® messages directly in Ami Pro.

Approach 3.0, the top-rated Windows database, becomes a shared reporting, forms and analysis tool. Its advanced integration with Lotus Notes lets you build sophisticated, information-intensive workgroup applications and join Notes data to other types of databases, from dBASE to SQL.

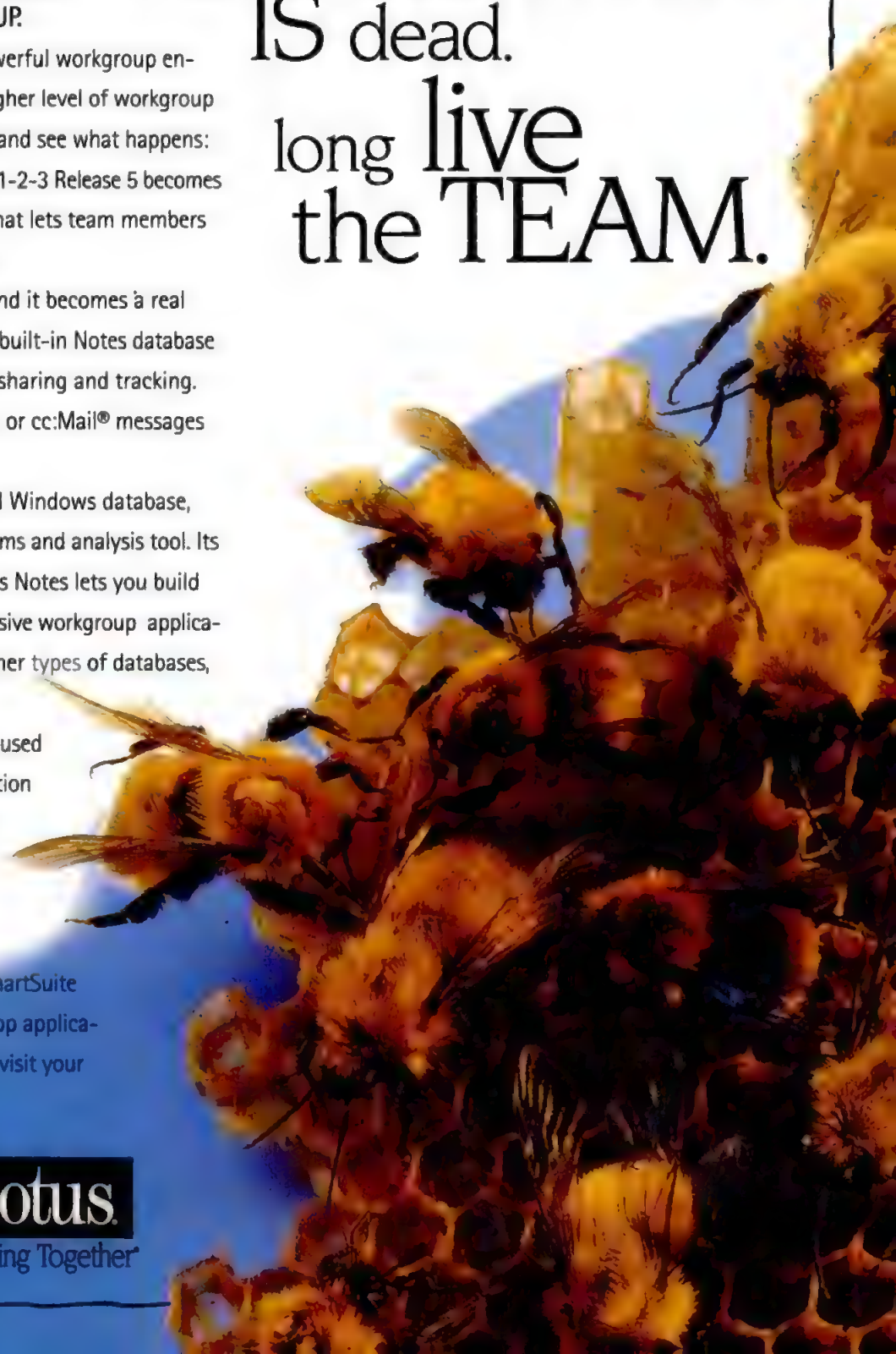
And Freelance Graphics 2.1, used with Notes, becomes a presentation storage system, a library of past presentations, which a team can browse and pull from to create new ones.

For more information on SmartSuite Release 3.0 and each of the 5 top applications that make up SmartSuite, visit your

Lotus Authorized Reseller or for a comprehensive multimedia overview call 1-800-TRADE-UP, ext. 9986* for the free Lotus Product Gallery CD. A SmartSuite upgrade costs \$299.††



the COMMITTEE
IS dead.
long live
the TEAM.



Lotus
Working Together

SMARTSUITE 3.0

SmartCenter
(to move between applications)

SmartMasters
(for predesigned templates)

Fast Format
(apply styles throughout documents)

ScreenCam
(to put your ideas in motion)

Smart Assistants
(to guide you)



Configurable Single Install
(for easy one-step installation)

Small Footprint On Your PC
(the most efficient suite available)

1-2-3/Approach Integration
(database power in your spreadsheet)



1-2-3 RELEASE 5 SPREADSHEET



SmartMasters
(useful predesigned templates)

Lotus Maps
(geographic visuals of data)

Lotus Approach Integration
(for extra database power)

Smart Assistants
(to guide you)

Range Routing
(for mailing spreadsheet ranges)

Direct Access To
Database Files
(open dBASE and Paradox®
files directly into 1-2-3)

OLE 2.0 Drag-And-Drop
(move or copy data, with
visual mouse cues)

APPROACH 3.0 DATABASE



PowerClick Reportwriter
(for wysiwyg design)

Smart Assistants
(to guide you)

InfoBox
(instant on-screen
manipulation)

X10 Speed Architecture
(for blazing speed)

Lotus 1-2-3 Integration
(for working with 1-2-3)

PowerKey™ Technology
(for direct access to
existing data)

Dynamic Crosstabs
(for drag-and-drop
analysis)

AMI PRO 3.1 WORD PROCESSOR



New Proofing Tools
(for easy document proofing)

Collapsible Click-And-
Drag Outlining
(simplifies organization)

Revision Marking
(edit documents without
confusion)

New Style Sheets
(more professionally
designed templates than ever)

Text Styling
(make your e-mail
look better)

WordPerfect Switchkit®
(the move from DOS
is painless)

Stick-It Notes
(add comments and
messages)

FREELANCE GRAPHICS 2.1 PRESENTATION GRAPHICS



Unique Three-Step Process
(for quick and easy
presentations)

One-Click Charting
(access a library of charts and
drawings with one click)

Page Sorter
(presentation management
at a glance— review and
rearrange with ease)

Import/Export
(more file formats than
ever— including
Harvard/DOS and
PowerPoint® 3.0)

ORGANIZER 1.1 PERSONAL INFORMATION MANAGER



Easy Linking
(makes cross-referencing
simple)

Flexible Printing
(for your manual planner,
mailing labels from your
address book)

Group Scheduling
(use with cc:Mail to set up
meetings with anyone on
your WAN or LAN)

Real Time Access
(instantly view co-workers'
busy and free time)

how the NEW SMARTSUITE 3.0 HELPS workgroups work.

The new SmartSuite 3.0. Featuring major new releases of 1-2-3, Ami Pro, Approach database and Freelance Graphics—plus the popular and powerful personal information manager Organizer—this is the ultimate integration of your most important desktop tools. For more information on SmartSuite Release 3.0 and each of the 5 top applications that make up SmartSuite, visit your Lotus Authorized Reseller or for a comprehensive multimedia overview call 1-800-TRADE-UP, ext. 9986* for the free Lotus Product Gallery CD. A SmartSuite upgrade costs \$299.**

Lotus
Working Together

*In Canada call 1-800-GO-LOTUS. **\$119 suggested retail upgrade price. *NSTL May 1994. **\$299 promotional price available while supplies last. ©1994 Lotus Development Corporation, 55 Cambridge Parkway, Cambridge, MA 02142. Lotus, Lotus Notes, 1-2-3, Approach, Ami Pro, cc:Mail, Freelance Graphics, SmartSuite, SmartIcons and Working Together are registered trademarks and ScreenCam, PowerClick, Notes/FX, Version Manager, SmartMasters, Organizer, PowerKey, X10 and NotesReady are trademarks of Lotus Development Corporation. WordPerfect and Switchkit are registered trademarks of WordPerfect Corporation. PowerPoint is a registered trademark and Windows is a trademark of Microsoft Corporation. Paradox is a registered trademark of Borland International, Inc.

Tangent Computer Inc.

● Tangent PCI-590

The \$3,390 Tangent PCI-590 is a well-designed mini-tower that uses the popular Intel motherboard as its foundation. It includes a number of quality components and offers a surprising amount of expansion room.

► FACT FILE

Tangent PCI-590

List price: \$3,390.

Processor/Memory:

Pentium/90, 16MB RAM, 256K external cache. **Data storage:** Conner 540MB IDE hard disk, integrated PCI disk controller, Sony CDU-33A-01 CD-ROM drive.

Display: Diamond Stealth Pro 64 PCI video controller card with 2MB VRAM, CTX CMS-1560/LR 15-inch monitor with a 70-Hz refresh rate at 1,024-by-768.

Software: DOS 6.2, Microsoft Windows for Workgroups 3.11.

Tangent Computer Inc.; 800-800-5550, 415-342-9388; fax, 415-342-9380.

481 on reader service card



SUITABILITY TO TASK

Windows applications	EXCELLENT
DOS applications	EXCELLENT
Expandability	GOOD

sion room. Its performance will not let you down either.

You probably could not fill nine drive bays inside a mini-tower system, but Tangent Computer gives you the option to try. The high level of integration inherent on Intel motherboards has helped Tangent Computer produce an internal design that—with the exception of partially blocked SIMM banks—is extremely well laid out. The motherboard provided three free ISA slots, one free PCI slot, plus one free shared PCI/ISA slot.

The Tangent PCI-590 performed equally well under DOS and Windows. The unit achieved an outstanding second-place score on the Winstone test. Its performance on our Graphics WinMark tests was also good: With a video subsystem based on a PCI Diamond Stealth Pro 64 adapter, the Tangent PCI-590 earned a top-ten score. The 540MB Conner IDE hard disk used in the disk subsystem helped the unit post an above-average Disk WinMark score.

On our DOS-based tests, the Tangent PCI-590 achieved a processor score that was only just above average, but the system's DOS video and DOS disk scores were well above average. This in turn contributed to an impressive second-place DOSmark score.

If you need a mini-tower with a lot of expansion room and terrific performance, the Tangent PCI-590 delivers.

The Tangent PCI-590 includes a one-year parts-and-labor warranty and one-year of on-site service.—WPF

Tri-Star Computer Corp.



EDITORS' CHOICE

Tri-CAD Vigor Pentium-90

Tri-Star Computer's expertise with high-end CAD workstations shows in the quality and performance of its Tri-CAD Vigor Pentium-90. Don't let this system's \$4,895 price tag daunt you; what you get is well worth the money.

Tri-Star ships the Tri-CAD Vigor with a 17-inch Idek monitor, a 16-bit Media-Magic sound card, a Sony double-speed CD-ROM drive, Labtec speakers, and two Western Digital 527MB hard disks, which easily slide out without opening the case. The advantage of removable hard disks is security: You can secure the hard disks into Tri-CAD Vigor's mini-tower case, yet easily remove them at the end of the day and lock them up somewhere else.

The Tri-CAD Vigor's

pair of 527MB

removable hard disks

can be mirrored

to ensure data integrity.

The Tri-CAD Vigor also includes an 8MB caching disk controller that supports disk mirroring. Mirroring ensures that both hard disks store the same information; if one disk fails, you still have a complete data set residing on the other disk.

The Tri-CAD Vigor's performance goes its good design one better. The system's most impressive accomplishment is

► FACT FILE

Tri-CAD Vigor Pentium-90

List price: \$4,895. **Processor/Memory:** Pentium/90, 16MB RAM, 256K external cache.

Data storage: Two Western Digital 527MB IDE hard disks, Tekram DC-690B PCI disk controller card with 8MB cache, Sony CDU-33A-01 CD-ROM drive. **Display:**

ATI Graphics ProTurbo 64 PCI video controller card with 2MB VRAM, Idek MF-8617 17-inch monitor with a 74-Hz refresh rate at 1,024-by-768. **Sound card:** MediaMagic ISP16.

Software: DOS 6.21, Microsoft Windows 3.11.

Tri-Star Computer, 800-800-7668, 602-731-4926; fax, 602-731-4979.

481 on reader service card



SUITABILITY TO TASK

Windows applications	EXCELLENT
DOS applications	EXCELLENT
Expandability	GOOD

VENDOR SERVICE & RELIABILITY

Reliability	ABOVE AVERAGE
Repair service	ABOVE AVERAGE
Technical support	ABOVE AVERAGE

its Winstone score: Only the Sys Performance Pentium and the Tangent PCI-590 scored higher. Its weakest scores—in the Disk WinMark and processor tests—are still above average. The remaining test scores include a third-place finish on the Graphics WinMark test and top-five finishes on the three DOS-based benchmark tests—DOSmark, video, and disk.

The Tri-CAD Vigor is top-notch in both performance and features. It comes with a two-year warranty on parts and a lifetime warranty on labor; one year of on-site service is included.—Jodi L. Wynblatt

Xinetron Inc.

● Xinetron Green Pentium 90MHz

Despite a hefty \$4,725 price tag (which includes a 1.2GB hard disk and 512K of L2 cache), the Xinetron Green Pentium 90MHz is one of Xinetron's most popular systems, according to the company. Given its low scores on all of our benchmark tests, though, you'll most likely be better off shopping around before you settle on this unit. And despite the "green" appel-

SUMMARY OF FEATURES

ENDS

PG MAGAZINE
Product of the Year

Products listed in alphabetical order

■ = YES □ = NO

	Tangent PCI-300	Tri-CAD Vigor Pentium-90	Xinetron Green Pentium 90MHz	Zenon Z-Titan Pentium 90MHz	ZEOS Pentara 90
List price (tested configuration)	\$3,390	\$4,895	\$4,725	\$2,845	\$3,195
Processor type and speed	Pentium/90	Pentium/90	Pentium/90	Pentium/90	Pentium/90
Hard disk capacity and interface	540MB IDE	Two 527MB IDE	1.2GB SCSI-2	540MB IDE	528MB IDE
Dealers/Direct-distribution channel	□ ■	■ ■	□ ■	□ ■	□ ■
Case style	Mini-tower	Mini-tower	Tower	Mini-tower	Tower
Power supply (and number of connectors)	200W (8)	200W (5)	250W (8)	230W (8)	200W (8)
DOS, Microsoft Windows version	DOS 6.2, Windows for Workgroups 3.11	DOS 6.21, Windows 3.11	DOS 6.2, Windows 3.11	DOS 6.2, Windows for Workgroups 3.11	DOS 6.2, Windows for Workgroups 3.11
Warranty	1 year	2 years parts, lifetime labor	2 years parts, 3 years labor	1 year parts, lifetime labor	1 year
On-site service charge	Included (1 year)	Included (1 year)	\$30.00 (1 year)	Included (1 year)	\$59.00 (1 year)
Processor and Memory					
Bus architecture (primary)	ISA	ISA	ISA	ISA	ISA
Bus architecture (secondary)	PCI	PCI	PCI and VL-Bus	PCI	PCI
Motherboard manufacturer	Intel	Intel	Super Micro	Intel	ZEOS
Chip set manufacturer	Intel	Intel	OPTI	Intel	Intel
Processor upgrade path	ZIF	ZIF	ZIF	ZIF	ZIF
BIOS version (or date)	AMI 3/23/94	AMI 1.00.03.AX12	AMI 2/1/94	AMI 3/23/94	Phoenix 4.03
Flash BIOS/16550 UART support	■ ■	■ ■	■ ■	■ ■	■ ■
Installable system RAM	8MB-128MB	8MB-128MB	4MB-128MB	4MB-128MB	4MB-192MB
External RAM cache	256K	256K	256K-512K	256K	0-512K
Cache architecture	Direct-mapped	Direct-mapped	Direct-mapped	Direct-mapped	Direct-mapped
Cache write design	Write-through	Write-back	Write-back	Write-back	Write-back
Components					
Available hard disk sizes	260MB-3.5GB	340MB-6.8GB	170MB-6GB	213MB-1GB	214MB-2GB
Disk controller location	Motherboard (PCI)	PCI card	PCI card	Motherboard	Motherboard (PCI)
Accessible drive bays (5.25", 3.5")	3, 2	3, 2	4, 0	3, 2	4, 0
Internal drive bays (5.25", 3.5")	2, 2	0, 2	3, 0	0, 3	2, 4
Floppy disk drives	1.44MB	1.44MB	1.44MB	1.44MB	1.44MB
CD-ROM drive	Sony CDU-33A-01	Sony CDU-33A	Toshiba 3401B	Mitsumi CRMCFX100102	Mitsumi CRMCFX00110
ISA, EISA, MCA slots	4, 0, 0	5, 0, 0	3, 0, 0	5, 0, 0	5, 0, 0
VL-Bus, PCI, proprietary local-bus slots	0, 3, 0	0, 3, 0	2, 4, 0	0, 3, 0	0, 3, 0
Parallel, serial, mouse ports	1, 2, 0	1, 2, 0	1, 2, 0	2, 1, 1	1, 2, 0
Display circuitry location	PCI card	PCI card	PCI card	PCI card	PCI card
Video chip set manufacturer	S3	ATI	ATI	ATI	S3
Video RAM	2MB-4MB	2MB	1MB-2MB	2MB-4MB	2MB-4MB

lation and a BIOS that supports power-saving modes, the Xinetron Green Pentium couldn't power-down to meet Energy Star standards during testing.

The system has bays and expansion slots in excess. In the full-size tower case that we saw, there were two internal and two external bays free. Wires tended to clutter the case, though, and they obstructed one of the unit's three ISA slots.

The low-voltage processor and American Microsystems BIOS make the "green" in this system's name appropriate. The unit can power-down the hard disk, slow the CPU clock, and cut power to the monitor (you can plug the monitor into the back of the system), each according to user-

defined settings. But we were unable to reduce the system's power consumption to the 30-watt level required to receive Energy Star certification.

On our benchmark tests, the Xinetron Green Pentium was not a star performer. This system's best showing was on our Graphics WinMark tests, but even there its score was merely average compared with the scores garnered by other reviewed units. The system did not fare well on the remaining tests. Its performance fell below the average mark on each set of tests, and it posted especially low disk scores. It finished nearly last on our Disk WinMark tests and only slightly better on our DOS-based disk tests.

FACT FILE

Xinetron Green Pentium 90MHz

List price: \$4,725.

Processor/Memory:

Pentium/90, 16MB RAM, 512K external cache.

Data storage:

Micropolis 1GB SCSI-2 hard disk, PCI local-bus disk-controller card, Toshiba XM-3401B CD-ROM drive.

Display:

ATI Ultra Pro PCI local-bus video-controller card with 2MB VRAM, ADI MicroScan 4GP 15-inch monitor with a 70-Hz refresh rate at 1,024-by-768.

Software: DOS

6.2, Microsoft

Windows 3.11.

Xinetron Inc.; 800-345-4415, 408-727-5509; fax, 408-727-6499.

482 on reader service card



SUITABILITY TO TASK

Windows applications **GOOD**

DOS applications **GOOD**

Expandability **EXCELLENT**

The Xinetron Green Pentium comes with a two-year parts and three-year labor warranty. Even considering the included extras, the high price and poor performance should deter you from taking this PC home.—JLW

Zenon Computer Systems

• Zenon Z-Titan Pentium 90MHz

The Zenon Z-Titan Pentium 90MHz is proof that high-end performance does not have to be expensive. At \$2,845, this is the least-expensive system in this roundup (albeit by only \$5). Its outstanding performance on all of our benchmark tests makes it even more of a bargain.

Zenon Computer Systems used the same Intel motherboard as many other entries in this roundup. The Zenon Z-Titan's internal design is mostly clean and uncrowded. A CD-ROM controller and a PCI-based ATI Mach 64 video card were the only things installed in its slots.

One caveat: In the unit we saw, access to the SIMM banks was blocked by the drive bay casing. One PCI slot and three ISA slots, as well as a shared ISA/PCI slot, were left free. There were also four bays left open.

This system's performance on our benchmark tests was among the best in this

group. It finished among the top ten units on our Winstone test. Its PCI-based ATI Mach 64 video card enabled it to achieve a top-ten score on both our Graphics WinMark and DOS-based video tests as well. The Disk WinMark and DOS disk test results were also above average, thanks in part to the 540MB Conner IDE hard disk running from the motherboard's integrated controller. The processor score was average, but the DOSmark result was well above the group average.

With the Zenon Z-Titan, Zenon has managed to combine a low price with top performance and a thoughtful design. The system comes with a one-year parts and lifetime labor warranty. —WPF

► FACT FILE

Zenon Z-Titan Pentium 90MHz

List price: \$2,845

Processor/Memory:

Pentium/90, 16MB RAM, 256K external cache

Data storage:

Conner 540MB IDE hard disk, integrated disk controller, Mitsumi CRMC-FX100102 CD-ROM drive

Display:

ATI Mach 64 video controller card with 2MB VRAM, MAG InnoVision MAG1564LX 15-inch monitor with a 76-Hz refresh rate at 1,024-by-768

Software: DOS 6.2,

Microsoft Windows for Workgroups 3.11

Zenon Computer

Systems; 800-899-

6119, 818-935-1828;

fax, 818-935-1826.

483 on reader service card



SUITABILITY TO TASK

Windows applications **EXCELLENT**

DOS applications **EXCELLENT**

Expandability **GOOD**

► FACT FILE

ZEOS Panthera 90

List price: \$3,195

Processor/Memory:

Pentium/90, 16MB RAM, 256K external cache

Data storage:

Seagate Technologies 528MB IDE hard disk, integrated PCI disk controller, Mitsumi CRMC-FX00110 CD-ROM drive

Display:

Diamond Stealth Pro 64 PCI video controller card with 2MB VRAM, ZEOS 15" Color SVGA 15-inch monitor with a 75-Hz refresh rate at 1,024-by-768.

Software: DOS 6.2,

Microsoft Windows for Workgroups 3.11, choice of one Lotus business application.

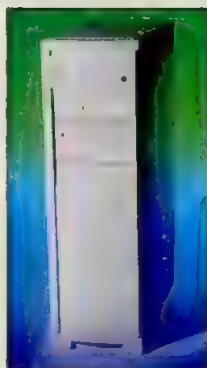
ZEOS International

Ltd.; 800-554-7172,

612-362-1234; fax,

800-362-1205

484 on reader service card



SUITABILITY TO TASK

Windows applications **EXCELLENT**

DOS applications **EXCELLENT**

Expandability **FAIR**

VENDOR SERVICE & RELIABILITY

Reliability **ABOVE AVERAGE**

Repair service **ABOVE AVERAGE**

Technical support **ABOVE AVERAGE**

drive. The unit's motherboard offers an integrated 12-bit mono audio system as well as integrated I/O port, IDE hard disk, and floppy disk drive connectors. The motherboard also includes a socket for an optional SCSI, Ethernet, or combination SCSI/Ethernet chip to activate the corresponding integrated ports.

Of the three PCI and five ISA slots, one PCI slot was filled with a Diamond Stealth Pro 64 video card and one ISA slot held a CD-ROM interface card. Four ISA slots are blocked by the processor's heat sink and by an occupied SIMM socket containing the external processor cache; this prevents them from accommodating full-length expansion cards.

The ZEOS Panthera fared very well on our benchmark tests. It posted top-five Winstone, Graphics WinMark, Disk WinMark, DOSmark, and DOS video scores. It also achieved a top-ten DOS disk score. Its processor score was average.

The ZEOS Panthera is a powerful yet affordable system. The only significant compromise is limited expandability as a result of poorly placed components. —RSA □

ZEOS International Ltd.

• ZEOS Panthera 90

At \$3,195, the ZEOS Panthera 90 offers quite a bit of performance for your dollar. The system distinguished itself on our tests, performing better than many far more expensive machines.

The ZEOS Panthera was housed in a tower case that provided plenty of room for its ten drive bays. One bay was occupied by a 528MB Seagate hard disk, another by a Mitsumi double-speed CD-ROM drive, and another by a floppy disk

FREE CATALOG!



Five Reasons To Shop Inmac For Your PC Hardware And Software

- 1 **Low Prices** On Every Product, Every Day.
- 2 **Largest Selection** Of PC Hardware And Software Available.
- 3 **Satisfaction Guaranteed** With Inmac's 30-Day Warranty.
- 4 **Fast Shipment** Call By 5 p.m. And It's Shipped The Next Day.
- 5 **Easy Ordering** Just Pick Up The Phone And Call Toll-Free.

CALL TOLL FREE
1-800-972-9240

Or FAX 1-800-972-3210, 24 Hours A Day

YES! Please reserve my **FREE** copy of the INMAC PC Select Catalog.

Your Name _____ Title _____

Company _____ # of employees at your company _____

Division/Mailstop/Suite # _____

Address _____

City _____ State _____ Zip _____

Area Code _____ Day Phone _____

**Mail To: Inmac, 2465 Augustine Drive
Santa Clara, CA 95052**

Priority Code
S940905

inmac

Samsung

A new point of view.



SyncMaster 17GLs

It's about how you work. Attitude. Satisfaction. Pride. The 17-inch SyncMaster monitors reflect today's changing lifestyles. Hassle-free. Value-oriented.

Samsung took for granted you wanted bright, crisp clear images that don't flicker. You're also concerned about safety and energy conservation, so they're standard on the whole series. Life should be as simple as possible, so we added

innovative new features like On-Screen Display and Real Color Control, and as you would expect, the GL Series comes with a two-year limited warranty.

Think about how you view your work. Samsung did. And came up with a whole new point of view. For additional information, call 1-800-933-4110.

TECHNOLOGY
THAT WORKS
FOR LIFE.



SyncMaster	14GL	15GL	17GL	17GLs
CRT Size	14"	15"	17"	17"
Dot Pitch	28	28	28	26
Maximum Resolution	1024 x 768	1024 x 768	1280 x 1024	1600 x 1280
Maximum Refresh Rate at Maximum Res. (Hz)	76	76	60	60
MPR II Low Radiation	•	•	•	•
Power Management	•	•	•	•
Flat Square Screen	•	•	•	•
On-Screen Programming	•	•	•	•
Real Color Control	•	•	•	•
Warranty	2 Years	2 Years	2 Years	2 Years

©1994 Samsung Electronics America Inc. The EPA energy star logo is not to be considered a product endorsement. Image on SyncMaster 17GLs courtesy of Mike Quin Design Office.

CIRCLE 046 ON READER SERVICE CARD

17-INCH MONITORS



The Bigger Picture

By John R. Quain

Monitors are used more than any other part of a system, yet many people treat them as an afterthought when they purchase a computer. Whether you're downloading documents, working on spreadsheets, or poring over the latest multimedia CD-ROM, you're staring at your monitor.

As Windows and graphics-based applications become widespread, more and more users are choosing to move up from 14- and 15-inch monitors to those with 17-inch displays. Seventeen-inch monitors let you see more windows on your screen than the 15-inch models do, and their increased sharpness and added features generally produce less eyestrain. While the list prices of the monitors in this roundup range from \$699 to \$1,990, with discounts many of these excellent performers can be had for less than \$800; some even go as low as \$650.

If you wish you could see more windows on your screen, now is the time to upgrade to a 17-inch monitor. Performance has improved, and there are more bargains to be had than ever.

► **IN THIS REVIEW**

<i>AcerView 76i</i>	202	<i>Ikegami CT-17A</i>	228	<i>Panasonic PanaSync C1791E</i>	248
<i>Addonics 172 GLR</i>	212	<i>MAG DX17F</i>	229	<i>Philips Brilliance 1720</i>	248
<i>ADI MicroScan 5EP</i>	212	<i>MAG MXP17F</i>	229	<i>Radius PrecisionColor Display/17</i>	250
<i>Altima V-Scan 80</i>	216	<i>MiTAC Performance Series L1782</i>	233	<i>Samsung SyncMaster 17GL</i>	250
<i>Amdek AM/817E</i>	216	<i>Mitsubishi Diamond Scan 17FS</i>	233	<i>Samsung SyncMaster 17GLs</i>	250
<i>Apple Multiple Scan 17 Display</i>	216	<i>Nanao FlexScan F550iW</i>	237	<i>Sceptre CL-617GL+</i>	251
<i>ASTVision 7L</i>	220	<i>Nanao FlexScan F560iW</i>	237	<i>SDIS ErgoView 170</i>	248
<i>Compaq QVision 172</i>	220	<i>NEC MultiSync 5FGe</i>	238	<i>Sony MultiScan 17se</i>	250
<i>CTX 1765GM</i>	220	<i>NEC MultiSync 5FGp</i>	238	<i>SuperMac SuperMatch 17 XL</i>	212
<i>CTX 1785GM</i>	220	<i>Nissei Sangyo America/ Hitachi SuperScan Elite 17</i>	238	<i>Tatung Omniscan CM17MKR</i>	253
<i>ETC ViewMagic CA-1765SPL</i>	221	<i>Nokia Multigraph 447X</i>	242	<i>ViewSonic 17, ViewSonic 17G</i>	254
<i>Goldstar Model 1725</i>	221	<i>Optquest 4000TC</i>	245	<i>Wen JK1775 Digital Color Control Monitor</i>	254
<i>Hyundai HL-7682A</i>	221	<i>Orchestra MultiSystems' The Tuba</i>	248	Performance Tests	204
<i>IBM 17P</i>	226	<i>Packard Bell PB8517SVGM</i>	248	Summary of Features	228
<i>IDEK/Iiyama VisionMaster MF-8617</i>	226				

Sales of 17-inch monitors are growing faster than ever before. According to Stanford Resources, a market research firm, in May 1993 about 6 percent of all the computer displays sold in the U.S. were 17-inch monitors. By spring 1994, that figure had nearly doubled, reaching 11.5 percent, or approximately 1,392,000 out of the total estimated 12,000,000 monitors sold. The popularity of 17-inch monitors is expected to continue increasing as prices decline and users demand a better picture. Stanford Resources predicts that by May 1995, 17-inch monitors will constitute about 15 percent of the display market.

WHY 17 INCHES?

The shift from 15-inch to 17-inch monitors makes sense when you consider what each gives you for the money. Priced from just under \$300 to more than \$800, 15-inch monitors are relatively inexpensive but are ill suited to the demands of high-resolution graphics, desktop publishing, and even mainstream Windows applications. Large spreadsheets don't fit on the screen; multiple Windows are difficult to see; and any resolution higher than 800-by-600 yields text and icons so small that you're likely to find yourself squinting at the display. By contrast, 17-inch monitors deliver a significantly larger viewing area, and their \$900 average street price is still reasonable when compared with the \$2,000 that some 21-inch units cost.

Monitor screen size is measured diagonally along the front of a monitor's cathode ray tube (CRT). The actual viewable

image of a 17-inch display can range anywhere from 15.4 to 16.6 inches, compared with about 13.3 to 14 inches for 15-inch monitors.

A diagonal increase of 2 inches may not sound like much, but it translates into a significantly larger total viewing area. While most 15-inch monitors have a maximum image area of about 90 square inches, a 17-inch monitor typically gives you about 115 square inches—a 28 percent bigger picture.

Furthermore, 17-inch monitors are ideally suited to 1,024-by-768 resolution. Since higher resolutions in effect shrink the size of text, icons, and other images on the screen, more data can be displayed. On a 15-inch display, however, the shrinkage that results when you switch up to resolutions at 1,024-by-768 or higher could lead to eyestrain.

Except for only one model (the NEC MultiSync 5FGe), all the monitors in this roundup can manage the still higher 1,280-by-1,024 mode when needed. Most users will find that at 1,280-by-1,024, text and icons are too small to work with on a 17-inch display. But if you plan on using such a high resolution, make sure the monitor can give it to you at a refresh rate of 72 Hz or better. Of the 42 monitors in this roundup, 21 have a refresh rate of 72 Hz or better in 1,280-by-1,024 mode.

REVIEW CRITERIA

For this issue, we requested 17-inch monitors that were MPR II-compliant and capable of displaying a minimum 1,024-by-768 noninterlaced image with a 72-Hz vertical refresh rate. In cases where the vendor offered a model with an FCC Class B rating, we asked for that model. We accepted only one model from each vendor except the market leaders, from which we accepted two. All review units had to be shipping to customers by late June, 1994.

We received a total of 42 monitors from 36 vendors. Another 13 vendors did not send units in time for our testing: Amax Engineering Corp., AOC International, Arche Technologies, Daytek Corp., Digital Equipment Corp., Edison Technologies, First International Computer Corp., Neotec Graphic International Corp., Ranger Technologies, Sampo Corp. of America, Samtron Displays, Sunshine 99, and TVM Professional Corp. Zenith Data Systems had no new models since our last review, and Epson America's Professional Series did not meet our filter because it was not MPR II-compliant.

All testing was done at Ziff-Davis Labs in Foster City, California. We used a MicroVision SpotSeeker III to judge image performance, a Minolta Color Analyzer CA-100 to detect color accuracy,

17-inch monitors have a significantly larger viewing area, and their price is reasonable compared with what 21-inch units cost.

and a Dranetz 8000-2 Energy Analyzer to check energy efficiency ratings. ZD Labs also ran subjective tests to let reviewers judge the capabilities of the monitors under real-world conditions. Each reviewer displayed a series of graphics images in order to examine image quality, geometric distortion, stability in switching between graphics modes, and the relative convenience of each model's controls.



IS IT SAFE?

The effect of monitor emissions on human health has been a controversial topic in the past few years. The Swedish government's Department of Labor introduced the MPR I standard in 1987 and the stricter MPR II standard in 1990, with the goal of regulating potentially harmful extremely low frequency (ELF) and very low frequency (VLF) monitor emissions. There is still much scientific debate as to the dangers of such emissions, but in general the MPR II specification is now accepted as a minimum requirement, and we recommend choosing a monitor that complies with this specification. Last year we tested all the reviewed monitors for MPR II compliance. We found that all the ones that claimed MPR II compliance were indeed compliant, so this year we elected to drop the tests for MPR II compliance.

Three years ago the TCO standard, a more rigorous low-emissions specification than MPR II, was introduced. In 1992, power saving and other ergonomic specifications were added to the TCO standard. To date, the TCO standard is not widely accepted in the U.S. Of the 42 units in this review, only the MAG MXP17F, Nokia's Multigraph 447X, and the Sceptre CL-617GL+ offer TCO compliance, though as an option priced from \$30 to \$199.

WHAT WE FOUND

This fall's roundup of 17-inch monitors showed a marked improvement over the models of years past. For example, on the same set of tests, the average modulation transfer function (MTF) score rose from last year's 38.6 percent to 48.4 percent. MTF results offer an objective assessment of a monitor's image sharpness.

RMS misconvergence was another

For high-end graphics:

• **Nokia Multigraph 447X**

For mainstream business applications:

• **Packard Bell PB8517SVGM**

The performance of this year's crop of 17-inch monitors is much improved over last year's. For example, market leader NEC earned an Editors' Choice last

year for its top-performing MultiSync 5FG. This year the NEC MultiSync 5FGp achieved better results in some tests yet came out only average.

There are two broad classes of users looking to trade up to a 17-inch display. Mainstream business users need more screen real estate to view large spreadsheets or have multiple windows open and accessible. A monitor that is easy on the eyes and the pocketbook fills the bill nicely. For desktop publishing, graphics editing, and CAD, image quality and color clarity must be top-notch, and the user must have control over all aspects of the display.

For mainstream users, the Packard Bell PB8517SVGM delivers the best balance of performance, features, and price of the monitors we examined. A strong performer at an unbeatable \$650, the Packard Bell's excellent focus promises crisp text for your spreadsheet and word processor documents. And its display is exceptionally bright. The Packard Bell delivers more features than you'd expect for its price, including on-screen controls for trapezoidal and color adjustments as well as VESA DPMS-compliant power saving.

Several high-end monitors offer superb image quality, but the Nokia Multigraph 447X stands out. On our performance tests, the Nokia was at or near the top in every measure. Its display is bright and sharply focused, and colors are rich and true. Easy-to-use on-screen controls let you adjust pin-cushioning, trapezoidal distortion, color attributes, and more. The Nokia delivers the unsurpassed image fidelity that graphics and CAD professionals require for a reasonable \$1,075.

Eight other high-end units warrant an honorable mention. The Nanao FlexScan F550iW, an Editors' Choice recipient last year, is still a features and performance leader. Most notable is the unit's Colorific software, which uses Eastman Kodak's precision color-matching system to match Microsoft Windows screen colors to color-printer output.

The siblings Radius PrecisionColor Display/17 (geared toward the Mac market) and Sony MultiScan 17se offer outstanding image quality. Users should find these units (\$1,050 street price) up to the most demanding tasks. We were also impressed with the image quality and feature sets delivered by the Apple Multiple Scan 17 Display and the Ikegami CT-17A. Orchestra MultiSystems' The Tuba (\$669) and the CTX 1765M (\$725) also provide decent performance.

The revamped Samsung SyncMaster 17GLs has an attractive \$995 street price and offers consistently fine performance for this class of monitor.

Note that only the CTX 1765GM and 1785GM, Nanao FlexScan F550iW and F560iW, Nokia Multigraph 447X, Philips Brilliance 1720, and Sony MultiScan 17se let the owner of a non-Energy Star PC take advantage of power saving by using a screen-blanking utility.

Most of the other monitors we looked at this year should serve your purposes adequately. Only the ETC ViewMagic CA-1765SPL, the MiTAC Performance Series L1782, and the Wen JK1775 Digital Color Control Monitor proved unacceptable in objective or subjective testing.

H I G H L I G H T S

17-Inch Monitors

THE BIG STORY in the 17-inch-monitor market this year is performance: Of the 42 units we looked at, only 3 had performance problems that would make them unacceptable. On the whole, display quality as measured on our objective tests has improved, and last year's standouts are now middle-of-the-pack.

DO YOU NEED a bigger screen? A 17-inch display set at 1,024-by-768 resolution lets you see more of your spreadsheets and fit more open windows on a screen than a 15-inch display does, which means much less scrolling and toggling. Graphics and CAD professionals need the larger display for their high-resolution, high-detail work.

BUSINESS USERS have a wide range of affordable choices. A display can be acceptable for office productivity chores despite a few flaws. A sharp focus and high refresh rate are the musts, and we found several units that

offer good performance for less than \$800. Budget-conscious buyers should check out the Editors' Choice Packard-Bell PB8517SVGM (\$650), Orchestra MultiSystems' The Tuba (\$669), and the CTX 1765GM (\$725).

AT THE HIGH END, monitors must offer unwavering image quality and complete control over a display's attributes. CAD users need good linearity and convergence so that fine lines remain distinct; desktop publishers need a sharp focus for tiny text; graphics pros need high resolution and true colors. Several units are likely candidates: our favorite, the Nokia Multigraph 447X; the Apple Multiple Scan 17 Display, Ikegami CT-17A, Nanao FlexScan F550iW and F560iW, the Radius PrecisionColor Display/17, and the Sony MultiScan 17se.

BUY GREEN. All but 6 of these 42 monitors provide power-saving features of some type. An Energy

Star-compliant monitor, which powers down the unit after a set period of inactivity, can knock more than 60 percent off the annual cost of running the unit.

UNIQUE FEATURES separate some units from the pack and may suit your particular need. The Nanao FlexScan F550iW and F560iW come with Colorific Color Management Software, which lets you match screen colors to your output. The CTX 1765GM and 1785GM, both FlexScans, the Sony MultiScan 17se, the Nokia Multigraph 447X, and the Philips Brilliance 1720 let owners of non-Energy Star PCs take advantage of power-saving features by using a screen-blanking utility such as the one found in Microsoft Windows. The NEC MultiSync 5FGe and 5FGp have clean back panels (the FCC information panel is tucked away underneath), which makes them more appealing for use in high-profile locations where the back is visible.

test result that showed a measurable improvement over last year, with the average falling from 0.14 mm to 0.13 mm. To paint an image on the screen, a monitor uses three electron beams: red, green, and blue. Misconvergence is the misalignment of one or more of the three beams as they hit the phosphors on the front of the screen. When displaying 1-pixel-wide white lines, a monitor with misconvergence problems will reveal a red, green, or blue halo at the edges rather than a sharp, solid white line. A lower misconvergence score means better performance.

We also found that the price/performance bar has been raised since last year's review. For example, NEC Technologies, the market leader for monitors in general and 17-inch monitors in particular, received an Editors' Choice last year for its top-performing MultiSync 5FG. This year, NEC's higher-priced model, the MultiSync 5FGp (about \$1,100 street price), achieved better scores on some

tests but was only an average performer on the whole. NEC's lower-priced entry in this roundup, the MultiSync 5FGe, has a relatively high street price of \$985, and it was the only 17-inch monitor that didn't come standard with antiglare treatment and did not offer resolutions above 1,024-by-768. NEC is expected to revise its best-selling MultiSync monitors by early fall with lines of 15- to 21-inch monitors addressing the needs of high-end users.

POWERING DOWN

Besides improving overall performance, monitor vendors have continued to add features. Once considered an unnecessary option, energy efficiency has now become de rigueur. The reason is simple: Not only is the monitor the computer component you use the most, it's also the component that can use the most power. A 17-inch monitor can draw 100 watts or more while in use. Fortunately, today's monitors are better at consuming less electricity, and all but six of the monitors in this roundup

meet the Environmental Protection Agency's Energy Star guidelines. The exceptions are the Altima V-Scan 80, Ikegami CT-17A, MiTAC Performance Series L1782, NEC MultiSync 5FGe, Orchestra MultiSystems' The Tuba, and Sigma Designs' ErgoView 170.

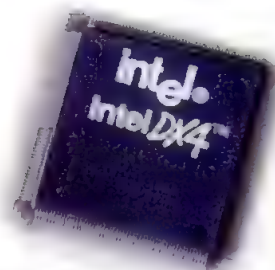
To be Energy Star-compliant, a computer peripheral must use 30 watts of power or less when idle. Buying a monitor that meets this requirement can save lots of money. For example, the annual electric bill for a monitor drawing 100 watts around the clock is \$88 (based on a 10-cent kilowatt-hour). Running a monitor at full power for a typical 8 hours at work and having it enter a power-saving suspend or off mode for the remainder of the day reduces the annual charge to just \$32. The \$56 you'll save each year may not sound like a lot of money, but if your business has hundreds of computers—well, you get the idea.

There are two standard methods monitor vendors use to garner an Energy Star

**The Highest Point In
Notebook Computing.
The New ZEOS
Meridian.TM**



The ZEOS Meridian™ The Ultimate Notebook Line.



Get desktop power in a notebook.

For the fastest computing around, the Meridian 400C and 800C are both available with Intel's DX4-100 microprocessor.

Highest Quality, Superior Performance & Power Up To 100MHz

Finally, desktop power to go. Travel around the world or to the highest peak. Work at home, in the office or on a plane. With the ZEOS Meridian line of color notebooks, the choices are endless and the power is unearthly.

What makes the Meridian the perfect workmate? Durable, sturdy construction that will travel anywhere, incredible power and performance that will take you to new heights, and more options than a road map. To meet your needs exactly, we offer you power, speed and memory choices—genuine Intel 486SX-33, 486DX2-50 or DX4-100

microprocessors; 4 or 8MB

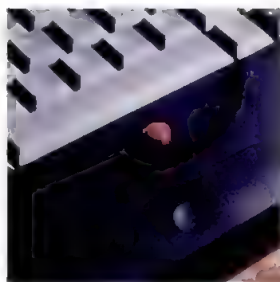
RAM user upgradable to

20MB; and IDE hard drives

from 175MB to 350MB.

The Meridian includes the

latest and hottest features: high-speed local bus video for super-fast video performance, two PCMCIA slots, and an 84-key keyboard with inverted "T" arrow keys and a new integrated TruePoint™ pointing device.



Moving around your desktop is a breeze with TruePoint,™ the conveniently located, easy-to-use, integrated pointing device.



ZEOS gives you award-winning service & support. No company has won more PC Magazine Readers' Choice for Service & Reliability awards than ZEOS—six in all. Plus, we were the first to provide 24-hour toll-free tech support—every day.

ZEOS Meridian 400 is also available with a monochrome backlit display (\$300 off package price).





The Meridian 400C and 800C both feature two Type II PCMCIA slots for easy upgrades with fax/modem, network and sound cards. The 800C also gives you the option to add a hard drive card with one Type III slot.



Portable power must be able to withstand the constant demands of travel. The ZEOS Meridian features solid, durable construction for a long life—even after the abuse of numerous road trips.

To save energy and battery life, all ZEOS notebooks include full power management features.



Meridian 400C Subnotebook

If you like to travel light, the Meridian 400C, at just four pounds and change, is your ideal traveling companion and ultimate subnotebook.

The 400C features a 7.8" diagonal, STN color, backlit screen (backlit monochrome display is also available); two Type II PCMCIA slots; and an ergonomic palm rest. Packages 2 and 3 also include an external ultra-light (9 oz.) 3.5" 1.44MB floppy drive.

Meridian 800C Notebook

At under 6 pounds, the Meridian 800C is light enough to travel anywhere yet it's large enough to use for presentations and regular desktop computing. You get the best of both worlds!

The 800C also includes a dual-scan color backlit screen for easy viewing; two Type II or one Type III PCMCIA slots; an internal 3.5" 1.44MB floppy drive; and an ergonomic palm rest.

Reach the highest point in notebook computing with the new ZEOS Meridian Line. There's no limit. With its durable design, awesome performance and technologically-advanced features, you'll be able to keep in touch with the office, write memos, organize your calendar and work on priority documents—wherever you are. For power that will take you to the ends of the Earth, call your ZEOS Systems Consultant today.

800-554-7172

**24 Hours
a Day**



ZEOS Meridian™ Notebooks.

Standard With Every ZEOS Meridian:



- Intel 486SX-33, 486DX2-50 or DX4-100 microprocessor.
- 8K (DX4: 16K) internal system cache.
- RAM expandable to 20MB.
- IDE hard drive upgradable to 350MB.
- PCMCIA slots: 400C: 2 Type II, 800C: 2 Type II or 1 Type III.
- Local bus video with 1MB video RAM.
- Display: 640 x 480 color VGA backlit LCD, up to 256 colors. 400C: 7.8" diagonal STN color. 800C: 10.3" diagonal DSTN.
- Supports an external SVGA color monitor at resolutions up to 1024 x 768.
- 84-key keyboard with embedded numeric keypad and 12 dedicated function keys, inverted "T."
- Integrated TruePoint™ pointing device.
- Replaceable, rechargeable NiMH battery.
- Serial port, enhanced parallel port, external VGA video port, external keyboard or PS/2 mouse port (800C includes both). 400C also with external floppy drive port.
- Full power management features include Low Power mode and programmable Standby features.
- AC-DC adapter with full range from AC110-240V to DC.
- 400C: 7.8" x 10.2" x 1.7"; 4.2 lbs. 800C: 8.9" x 11.7" x 1.9"; 5.9 lbs.
- EPA Energy Star compliant.
- FCC Certified Class B; UL Listed.
- ZEOS Customer Satisfaction Package.

Processors	Package 1		Package 2		Package 3	
	400C	800C	400C	800C	400C	800C
486SX-33	\$1995 Lease \$73/mo.	\$2295 Lease \$84/mo.	\$2295 Lease \$84/mo.	\$2495 Lease \$91/mo.	\$2595 Lease \$95/mo.	\$2795 Lease \$102/mo.
486DX2-50	\$2195 Lease \$80/mo.	\$2495 Lease \$91/mo.	\$2495 Lease \$91/mo.	\$2695 Lease \$99/mo.	\$2795 Lease \$102/mo.	\$2995 Lease \$110/mo.
DX4-100	\$2495 Lease \$91/mo.	\$2795 Lease \$102/mo.	\$2795 Lease \$102/mo.	\$2995 Lease \$110/mo.	\$3095 Lease \$103/mo.	\$3295 Lease \$110/mo.
	➤ 4MB RAM ➤ 175MB IDE hard drive ➤ 800C: Internal 3.5" 1.44MB floppy drive ➤ MS-DOS 6.2		➤ 4MB RAM ➤ 260MB IDE hard drive ➤ 3.5" 1.44MB floppy drive, 400C: External, 800C: Internal ➤ Custom carrying case ➤ MS-DOS 6.2 ➤ Microsoft Windows for Workgroups 3.11 ➤ Lotus Organizer		➤ 8MB RAM ➤ 350MB IDE hard drive ➤ 3.5" 1.44MB floppy drive, 400C: External, 800C: Internal ➤ Custom carrying case ➤ Extra battery ➤ MS-DOS 6.2 ➤ Microsoft Windows for Workgroups 3.11 ➤ Lotus Organizer	

\$300 off with monochrome display! (400C only)

Favorite Options

Hard Drive Upgrades

175MB to 260MB	\$95
260MB to 350MB	\$145

Memory Upgrades

4MB to 8MB	\$196
8MB to 20MB	\$999
4MB to 20MB	\$1195

PCMCIA Cards

Networking

PCMCIA Ethernet adapter.	
10 Base T (Twisted Pair)	\$139
10 Base 2 (Coax)	\$169

Modems

PCMCIA 24/96 data/fax modem with Internal DAA	\$149
PCMCIA 14.4/14.4 data/fax modem with Internal DAA	\$229

SCSI Adapter

PCMCIA Bus Toaster SCSI Adapter with Corel SCSI 2.0	\$199
---	--------------

Multimedia

PCMCIA .WAVjammer Stereo Sound Card with Microsoft's Sound System 2.0	\$279
---	--------------

Floppy Disk Drive

400C: External 3.5" 1.44MB FDD (9 oz.)	\$99
--	-------------

Accessories

Custom nylon carrying case	\$79
Custom leather carrying case	\$178

SPECIAL PACKAGE PRICE:

14" SVGA color monitor, keyboard and mouse. (with notebook purchase)	\$399
--	--------------

Power

Extra battery	\$99
Extra AC adapter	\$69
DC-DC adapter	\$49
Telemax surge suppressor	\$69

Fax Orders: 800-362-1205 or 612-362-1205. Phone Orders: Outside U.S. and Canada: 612-362-1212, Government: 800-245-2449. Purchase Orders, MasterCard, VISA, Am Ex, Discover, COD and affordable leasing programs.

800-554-7172

**24 Hours a Day
365 Days a Year**



Purchase orders are subject to approval. Business leasing programs available. Lease prices based on a 36-month lease. 10% purchase option. All prices, specifications and availability are subject to change without notice; call to confirm these and warranty details. Prices do not include shipping. Novell compatibility is Developer Tested Only. Novell makes no warranties with respect to this product. All products and company names are trademarks or registered trademarks of their respective holders. Intel Inside Logo is a trademark of Intel Corporation. ZEOS is a registered trademark. Computers Now! is a registered servicemark. ZEOS Meridian and TruePoint are trademarks of ZEOS International Ltd. © 1994 ZEOS International Ltd., 1301 Industrial Blvd., Minneapolis, MN 55413 USA. ZEOS is a publicly traded company (NASDAQ symbol: ZEOS) MER-PCM-9409B

CIRCLE 151 ON READER SERVICE CARD.

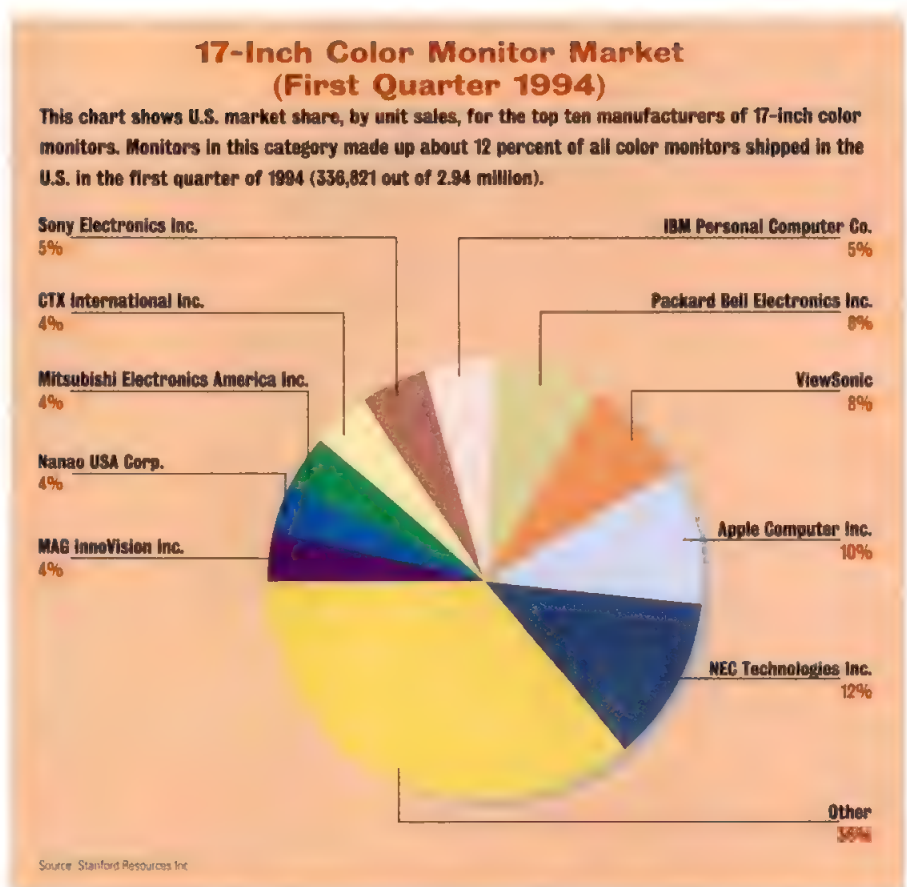
rating. One, defined by the Video Electronics Standards Association (VESA) is the Display Power Management Signaling (DPMS) specification. On the PC end, DPMS requires software or firmware that is capable of telling the graphics adapter to signal a DPMS-compliant monitor to power down in three stages: Standby, Suspend, and Off. *Standby mode* saves about 30 percent of the power and allows for instant recovery at the touch of key. *Suspend mode* decreases power consumption further by turning off the monitor's main heater; however, it can take several seconds to recover when you want to start work again. *Off mode* cuts power to nearly everything in the monitor except its microprocessor.

The drawback of DPMS is that you may need a new graphics adapter or updated software to enable it. Of the vendors represented in this review, Addonics, ADI, Optique, and ViewSonic circumvent this problem by offering special terminate-and-stay-resident (TSR) software that lets you power down the monitor without an Energy Star PC or DPMS-compliant graphics adapter. ADI, Mitsubishi, Nanao USA, and Nissei Sangyo/Hitachi offer Windows-compatible software with the same capabilities. (Mitsubishi charges \$19.95 for its software utility.) But keep in mind that these packages may not be compatible with every VGA adapter on the market, since they use a previously unused VGA call.

Other models work via *screen blanking*, an alternative method of powering down. Essentially, they recognize when Windows 3.1's screen-saving utility or a screen saver like After Dark has blanked the screen and respond by powering down. In this roundup, seven monitors—the CTX 1765GM and 1785GM, the Nanao FlexScan F550iW and F560iW, Nokia's Multigraph 447X, Philips' Brilliance 1720, and Sony's MultiScan 17se—let you power down using nothing more than a screen-blanking utility.

FILLING OUT FEATURES

Additional features you should expect from a good 17-inch display include precise digital controls and an internal microprocessor to store user-defined control settings. Of the 42 monitors in this review,



22 are fully digital. One convenient feature long overdue is the on-screen display of image adjustments. Twelve of the monitors reviewed here offer easy-to-follow on-screen menus that show you, for example, just how much you are boosting the contrast. We found the on-screen assistance from the Nokia and ViewSonic models particularly helpful.

Those of you who need to facilitate your desktop publishing work should note the inclusion of color-matching controls on 30 of these monitors. Adjusting the color balance of the image lets you match what you see on-screen more closely to what you print. The Nanao FlexScan F550iW and F560iW also include Sonnetech's Colorific software, which stores color settings, and Eastman Kodak's color-management system, which compensates for ambient light conditions. We tried the Colorific software and found it powerful and easy to use. But we believe that for no-compromise desktop publishing convenience, you really should go for a 21-inch display.

CAD users should note the inclusion of convergence controls in the Apple

Multiple Scan 17 Display, Compaq's QVision 172, the IBM 17P, the Ikegami CT-17A, the Nanao FlexScan 550iW, Nokia's Multigraph 447X, Radius's Precision Color Display/17, Samsung's SyncMaster 17GLs, and Sony's MultiScan 17se. Although convergence controls can be dangerous in inexperienced hands—you can wreak havoc with the image rather than improve it—a keen-eyed user can use them to correct the minor color halos that result when the three electron beams don't line up exactly on-screen. This is especially important for CAD users who frequently work with thin lines on the screen.

Lastly, degaussing buttons are all but mandatory on 17-inch monitors. In this roundup, they can be found on all but the Apple Multiple Scan 17, Radius's Precision Color Display/17, and Sony's MultiScan 17se. Monitors of this size and larger are particularly sensitive to electromagnetic interference, which is common in crowded offices and can result in image discoloration, particularly along the sides of the screen. A degaussing button lets you dissipate the electromagnetic

buildup without turning the monitor off and on again.

MONITOR BASICS

Before poring over our reviews and feature charts, first-time monitor buyers should pay attention to some additional display basics. First and foremost is the monitor's tube type. The monitors in this roundup use two different types of cathode ray tubes (CRTs): flat-square and vertically flat.

Flat-square tubes, the most common type, are somewhat misnamed. Such screens are neither flat nor square, but they appear flatter than conventional CRTs because the curvature of the screen represents a section of a larger sphere. It's the difference between cutting a same-sized section from a basketball versus a baseball.

Vertically flat tubes, on the other hand, are flat along the vertical axis but curved along the horizontal axis like standard CRTs. Unlike flat-square tubes, which seem to be cut out of a sphere, the face of a vertically flat screen looks as if it had been cut out of a cylinder. The best-known vertically flat tubes are the Trinitron CRTs made by Sony and used in eight of the monitors in this roundup. Mitsubishi has also started to produce its own vertically flat tube, called the DiamondTron, but none of the models in this review have it.

Dot pitch also affects the image you see on-screen. Inside the monitor's tube is a composite metal screen with holes in it called a *shadow mask*. Most tubes have a shadow mask that is punched through with round holes or dots. The one exception, Sony's Trinitron tube, uses a shadow mask that has slots rather than round dots; this type is called an *aperture grill* or *stripe mask*. Each tiny dot in a shadow mask has a colored phosphor in it (red, green, or blue). The dot pitch, measured in millimeters, is the distance between one phosphor dot of a particular color and the next closest dot of the same color. The smaller the dot pitch, the potentially

sharper the image. In this roundup, 23 monitors have a dot pitch of 0.26 mm or less, although up to 0.28 mm is acceptable in a 17-inch monitor. None of the monitors reviewed here have a dot pitch greater than 0.28 mm.

Finally, to improve the clarity of a display's image, monitor manufacturers use some form of *antiglare treatment* to combat such hostile office conditions as fluorescent lights. Silica coating is a popular treatment because it also acts as an anti-static to resist the accumulation of dust. But since many users find that a silica coating tends to dull the overall display, several manufacturers have resorted to other techniques.

These newer, improved compounds are usually bonded to the front of the CRT in several layers to improve brightness. Several such treatments are commonly used; they are referred to as ARAG (antireflective, antiglare), ARAS (antireflective, anti-static), and AGRAS

(antiglare, antireflective, antistatic).

The effectiveness of these solutions is a largely subjective matter. One manufacturer, NEC, offers no antiglare treatment on some of its models, including the MultiSync 5FGe reviewed here. This gives the monitor an apparently brighter picture; customers who find their office lighting demands some kind of antiglare treatment can buy an optional \$100 filter to reduce the reflections on the screen.

GETTING SPECIFIC

As with any PC peripheral, monitor buyers face a welter of manufacturer-rated specifications. Understanding the basics of how a monitor works will help you navigate the jungle of scanning frequencies and refresh rates.

Monitors create an image by firing electron beams at the front of the screen

in horizontal lines that scan across the screen from top to bottom. An *interlaced display*, like the one your home television has, creates one full image in two passes, scanning the even lines first and then going back to the top of the screen to scan the odd lines in between. Interlaced displays are fine for moving images, where the screen is constantly changing, but are poor for static images such as numbers and letters. Consequently, most computer monitors have *noninterlaced displays* that paint all the horizontal lines on screen in a single pass. All the monitors reviewed here are able to display a minimum of 1,024 by 768 pixels in noninterlaced mode.

The *horizontal frequency* of a monitor indicates the horizontal scan rate—the number of lines the monitor can draw per second—measured in kilohertz (kHz). Closely related to this is the number of full screens the monitor can paint in one second. This is called the *vertical refresh rate*, or *vertical scan rate*, and is measured in hertz (Hz).

The more time it takes the monitor to paint each horizontal line, however, the fewer screens it will be able to create each second. Hence, horizontal frequency and vertical refresh rates are closely related. Furthermore, the higher the resolution, the greater the number of lines that have to be drawn. At higher resolutions, a monitor's vertical refresh rate often drops. The lower the vertical refresh rate, the more the screen will appear to flicker.

When shopping for a monitor, you should pay particular attention to the vertical refresh rates the monitor can achieve at each resolution you plan to use. Generally speaking, most people perceive flicker whenever a monitor's vertical refresh drops to 60 Hz or lower. Hence the higher the refresh rate, the better off you are. VESA currently recommends a 75-Hz vertical refresh rate at all resolutions from 640-by-480 up to 1,280-by-1,024, although 72 Hz is acceptable. However, if you're upgrading your

Interlaced displays are fine for moving images, where the screen is constantly changing, but are poor for static images like numbers and letters.

Our Contributors: JOHN R. QUAIN is a contributing editor of *PC Magazine*. STEPHEN CHAN is an associate project leader and KATIE BARNES is a project leader at Ziff-Davis Labs. MICHAEL J. ZULICH is a project leader at PC Magazine Labs. LEON ERLANGER was the associate editor in charge of the story, and BRIAN FIKES was the project leader.

**Everything else
is either overpriced
or underfeatured.**

When you compare the premium monitors feature-for-feature and spec-for-spec, SuperScan wins hands down every time. Comparable monitors from NEC, Sony, Viewsonic, Mitsubishi and Nanao all cost more. Or deliver less.

So whether you choose your new monitor for its price or its performance, choose SuperScan. Either way you win.

Call for details.
(800) 441-4832.

4-1-1-0-1-0

NSA

	SuperScan Supreme 21	SuperScan Elite 21	SuperScan Elite 20	SuperScan 20S	SuperScan Elite 17	Super 17S	SuperScan 15S
Dot Pitch	0.26 mm	0.28 mm	0.28 mm	0.31 mm	0.26 mm	0.26 mm	0.28 mm
Max. Horizontal Freq.	110 kHz	90 kHz	90 kHz	69 kHz	82 kHz	64 kHz	64 kHz
Max. Resolution	1600 x 1200	1600 x 1200	1600 x 1200	1280 x 1024	1600 x 1200	1280 x 1024	1280 x 1024
Max. Refresh @ Max. Resolution	85 Hz	72 Hz	72 Hz	60 Hz	66 Hz	60 Hz	60 Hz
Energy Star/VESA DPMS	Yes	Yes	Yes	No	Yes	Yes	Yes
Suggested Selling Price	\$2,745	\$1,995	\$1,695	\$1,395	\$1,049	\$799	\$449

MPR II

SuperScan Elite 21

HITACHI



SuperScan

An advantage you can clearly see.

Access Graphics (800) 733-9333. Computer Graphics Distributing (301) 921-0011. DSS (800) 231-4279. Gates/FA (800) 332-2222. Graphics Technologies (800) 999-9382. International Computer Graphics (800) 659-4244. Merisel (800) 637-4735. SED (800) 444-8962. Tech Data (800) 237-8931.

The ENERGY STAR™ emblem does not represent EPA endorsement of any product or service.
CIRCLE 032 ON READER SERVICE CARD

17-Inch Monitors

monitor, you'll also need to make sure that the graphics adapter you currently own can deliver those rates.

Perhaps the most confusing term bandied about in monitor ratings is *multiscanning*, which refers to the ability of a monitor to show images in several resolutions. There are two types of multiscanning monitors: *multiple fixed-frequency* and *variable frequency*. The former can handle only a restricted set of standard resolutions but won't recognize signals that fall outside of those narrow ranges. A variable-frequency monitor, on the other hand, automatically senses and displays any signals that fall within its specified range. Variable-frequency designs are preferable because they can adapt to a greater number of resolutions and are thus more likely to be compatible with future graphics adapter upgrades.

All the monitors in this roundup are the variable-frequency type. You should look for a monitor with the widest horizontal scanning range you can afford. A range of 30 kHz to 66 kHz is typical of low-end 17-inch monitors, while better models are generally able to field signals from 30 kHz to 82 kHz.

SHOPPING TIPS

PC Magazine's objective and subjective tests of the monitors it receives are the most extensive available. Monitors, however, are much more susceptible than other units, such as hard disks, to minor variations in production changes. Because of their sensitive components, they can be easily affected by rough handling during shipping, either from the vendor to the store or by mail-order to you. After receiving a monitor, look for shipping damage and carefully examine the monitor in various modes. Particularly bad convergence, hot spots (where one area of the screen appears brighter than the rest), or image discoloration are indications that the monitor may have been mishandled during shipping. Money-back guarantees (with no restocking charges, please), extended warranties (up to 3 years), and free technical support can help avoid headaches, particularly if you are buying mail-order.

When judging the image quality of a monitor, there are a few additional problems pertaining to image distortion that

you should watch out for. One common type is called *barrel distortion*. It usually occurs on conventional curved or flat-square monitors and results in an image that looks convex—as if it were projected on a barrel.

Pincushion distortion is the opposite problem. The image appears to be contracted toward the center of the screen, which results a slightly concave look. Flat-screen monitors often appear to have a pincushioning effect.

Buyers can also take advantage of some of the other software that *PC Magazine's* reviewers use. Foremost among the commercially available programs is DisplayMate for Windows from Sonera Technologies (800-932-6323). DisplayMate is an especially helpful utility for corporate buyers purchasing and maintaining hundreds of monitors. The \$79 program contains dozens of test patterns that can help you evaluate the image quality of a monitor you plan to buy as well as make adjustments on those you already own. DisplayMate also includes instructions and advice for sophisticated users dealing with high-end features like gamma correction.

PRACTICAL PROBLEMS

Don't forget that after sorting through all these features and specifications, you still have to fit the monitor on your desk and plug it into your computer. A 17-inch monitor can demand a lot of desktop real estate—from 17 to 20 inches of depth (for the NEC MultiSync 5FGe, for example) compared with about 15 inches for a 15-inch monitor. Furthermore, those planning to plant a new display on top of a PC should consider its weight. Typically, a 17-inch display weighs about 40 pounds, but it can be as heavy as 60.

If you're buying a monitor for a system you already own or are buying a new system component by component, make sure you check the graphics card's manual before you go monitor shopping. Match the graphics adapter's scanning frequencies to the monitor's capabilities and check the adapter's output connection. Nearly all the monitors in this roundup come with standard 15-pin mini D-sub ports for VGA graphics adapters; those that don't, such as the Apple-centric Ikegami, Radius, SuperMac, and Apple models in-

clude adapters. However, if CAD work or desktop publishing is a part of your daily routine, you may have a high-end graphics adapter with coaxial BNC connections for separate red, green, blue, and sync signals. If so, you'll need a monitor to match. Twenty monitors in this group offer both types of connections, and four—the Altima V-Scan 80, CTX 1785GM, Hyundai HL-7682A, and MAG MXP17F—allow you to switch between the two. This can be handy for those who need to work with both Macs and PCs.

Lastly, if you're unfamiliar with monitor manufacturers and want information about a particular maker's track record, look at *PC Magazine's* most recent Service and Reliability issue (January 11, 1994). In the story "Monitoring Satisfaction" you'll find out how readers rated the monitors they use.

By arming yourself with all this information and reading the following reviews, you're bound to find a 17-inch monitor that meets your needs and fits your budget. Once you've covered all the basics, you're ready to judge your intended purchase with your own eyes.

Acer America Corp.

• AcerView 76i

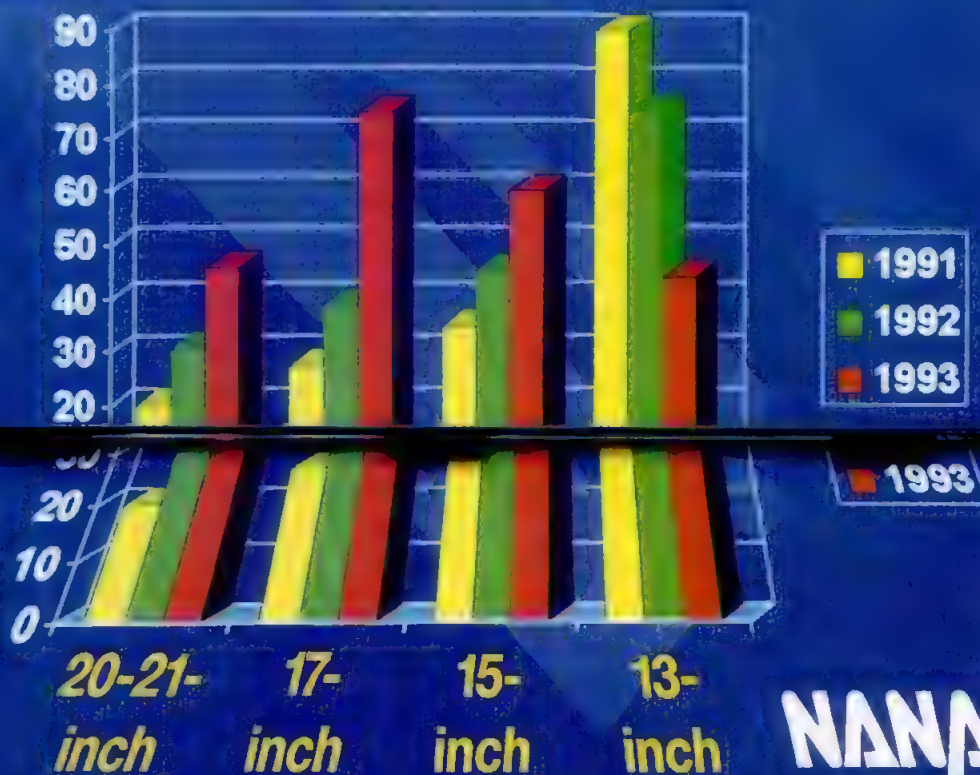
BY STEPHEN CHAN

We had mixed feelings about the AcerView 76i. The picture was bright and sharp, but the unit's horizontal pincushioning error of 0.77 mm was clearly visible and well beyond our acceptable limit of 0.60 mm; this is despite the fact that pincushioning correction is under the user's control. Misconvergence problems were also clearly noticeable at the corners of the display. The AcerView (\$849 street) is not appropriate for desktop publishing (DTP)

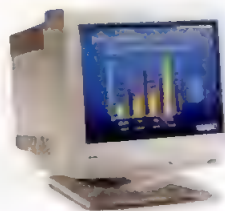


Now what you see
is what you print.

Monitors in
Environment



NANAO



Nanao has something
you've been waiting for: WYSIWYP.

We're the first monitor manufacturer to include new Colorific™ color management software free with our 17" or larger FlexScan® professional display monitors. With easy-to-use, set-and-forget Colorific, you can print graphs, presentations, transparencies and other business documents – the first time – in the colors you actually see on the screen. Just think what this means: output color accuracy. Time savings. Reductions in trial-and-error draft printing. No more surprises. Colorific is the first software-only color calibration system that replaces add-on hardware solutions costing from \$300 to \$1,000. And it's available today. Once again, Nanao continues a tradition of industry innovations. Our award-winning FlexScan family of monitors are renowned for ultra high resolution, sharp edge-to-edge focus, energy-saving features and high product reliability. Now we're adding one more breakthrough to the list: WYSIWYP with Colorific.®

INCLUDING SONNTECH'S
colorific



NANAO

Superior In Every Detail

NANAO USA CORPORATION
23535 Telo Avenue, Torrance, CA 90505
310-325-5202 Fax: (310) 530-1679
1-800-800-5202

3 Year Warranty*

This year's MicroVision SpotSeeker III test suite revealed that the field of 17-inch monitors has improved over the past year. Though there are no clear overall winners, Nokia's Multigraph 447X (an Editors' Choice recipient), the Apple Multiple Scan 17 Display, and the Ikegami CT-17A stand out from the pack as all-round solid performers.

What the Numbers Mean

Each of the above three monitors performed exceptionally well on one or more of our tests. The Nokia and Samsung's SyncMaster 17GLs had the best (lowest) RMS Misconvergence score (0.08 mm), well below the 0.2-mm visual threshold for this test. The Ikegami had the highest Average MTF score (61 percent) and the best (lowest) RMS vertical pincushioning score (0.17 mm). The Apple, though not the best in any one category, placed near the top across the board.

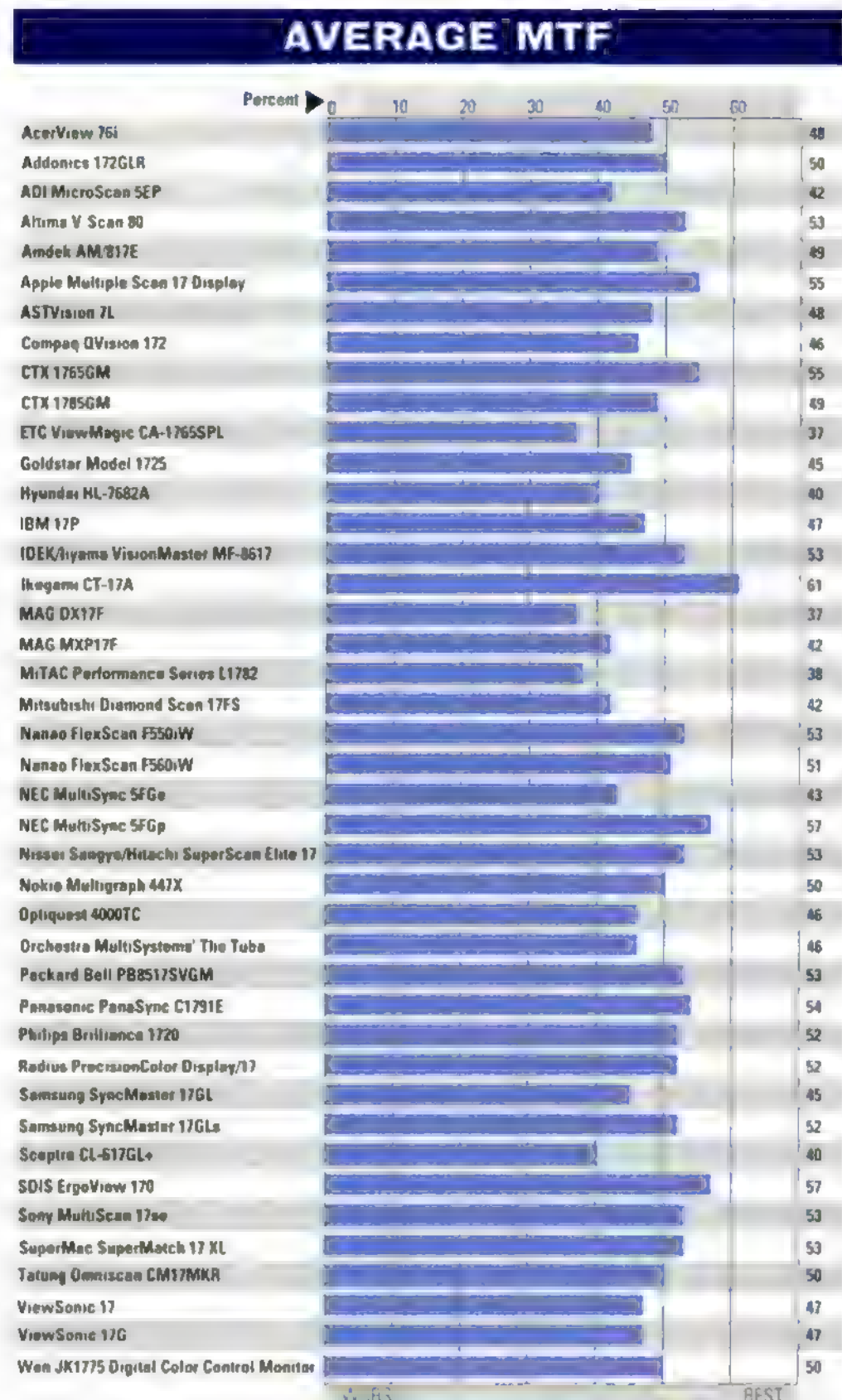
Every monitor reviewed had an acceptable Average MTF score, though the MAG DX17F (37 percent), ETC's View-Magic CA-1765SPL (37 percent), and the MiTAC Performance Series L1782 (38 percent) neared the lower end of the scale, close to the minimum acceptable score of 35 percent. The NEC MultiSync 5FGp and the SDIS ErgoView 170, each with a 57 percent score, closely followed the top-scoring Ikegami.

The Maximum Usable Brightness test measures how much the brightness can be increased before screen focus is lost. As a monitor ages, the screen phosphors become less responsive, forcing the user to increase the level of brightness. A high score means that a user can adjust the display to a very bright level without losing image focus.

All of the monitors tested had Maximum Usable Brightness scores above the minimum acceptable score of 20 foot-lamberts. Radius's PrecisionColor Display/17 and Packard Bell's PB8517SVGM had exceptionally bright displays, at 39.4 and 38.5 fL respectively. Philips' Brilliance 1720 and the ASTVision 7L at 20.2 fL had scores that were borderline but still acceptable. Additionally, both MAG monitors were borderline performers, with scores of 20.8 fL for the MAG DX17F and 21.9 fL for the MAG MXP17F.

The RMS Misconvergence test showed each monitor to be below the acceptable 0.2-mm maximum score. Here the Nokia and the SyncMaster 17GLs tied for the best score (0.08 mm), followed closely by the Goldstar Model 1725 and Panasonic's PanaSync C1791E at 0.09 mm. The Optique 4000TX and the Wen JK1775 Digital Color Control Monitor neared the 0.2-mm maximum, each scoring 0.18 mm.

The Pincushioning tests, both RMS horizontal and RMS

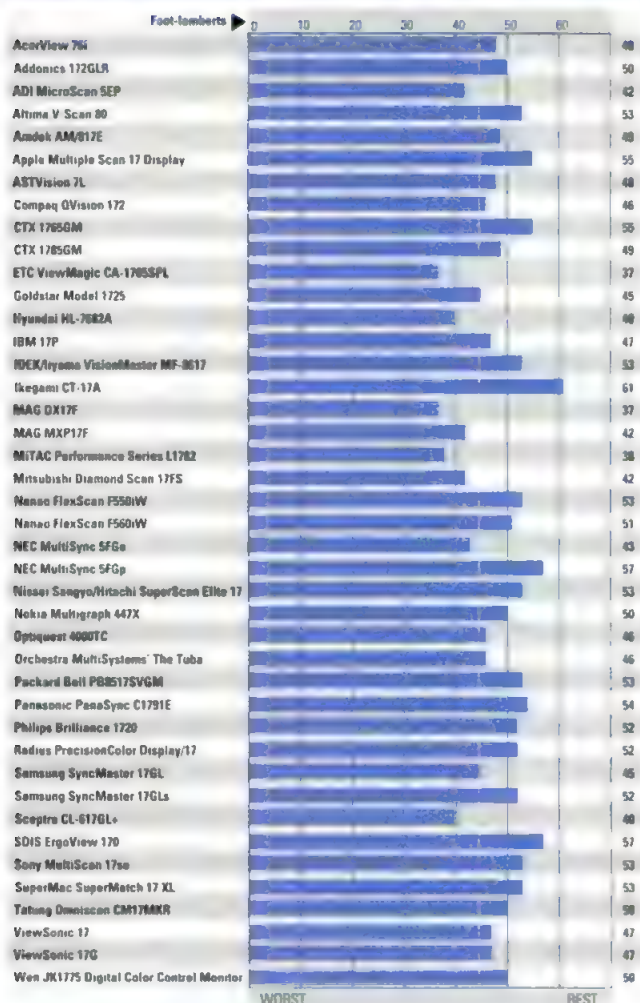


vertical, were areas of weakness for the monitors in this test group. On the RMS horizontal test, the Addonics 172 GLR (0.94 mm), the CTX 1765GM (0.78 mm), the AcerView 76i (0.77 mm), and the Tatung Omniscan CM17MKR (0.75 mm) were all outside the acceptable limit of 0.60 mm. By contrast, Philips' Brilliance 1720, Compaq's QVision 172, the NEC MultiSync 5FGp, and the ViewSonic 17G came in with scores only slightly worse than acceptable: 0.69 mm, 0.68 mm, 0.67 mm, and 0.62 mm, respectively.

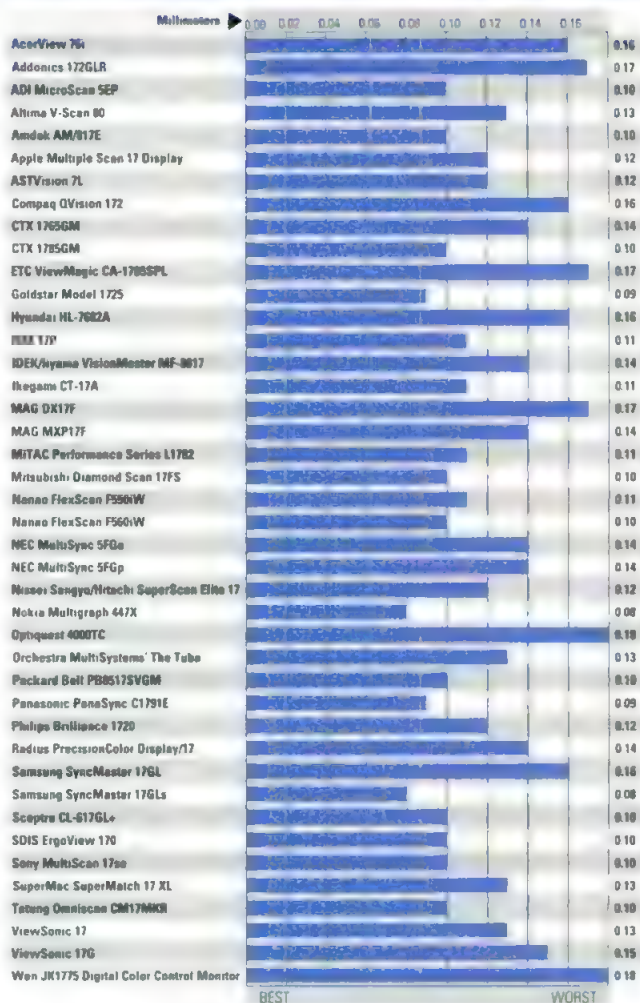
The vertical pincushioning error seems less pronounced, as only two monitors failed to meet the 0.60-mm threshold of acceptability: the Wen at a whopping 1.33 mm and Orchestra MultiSystems' The Tuba at 0.78 mm. All other scores were within the acceptable range.

Whether pincushioning is noticeable depends not only on the magnitude but also on the location and width of the deviation. Generally, vertical pincushioning is more noticeable than horizontal; this is especially true of Trinitron tubes because of the curvature of their screens.—*Analysis written by Brian Fikes*

MAXIMUM USABLE BRIGHTNESS



RMS MISCONVERGENCE



How We Tested

For all of the tests performed in this review, ZD Labs used a Northgate Slimline SP 433 with 8MB of RAM, running DOS 6.0, and an ATI Graphics Ultra Pro graphics card with 2MB of VRAM. The graphics card was set for 1,024-by-768 resolution and a 72-Hz vertical refresh rate. In addition, ZD Labs used three other pieces of equipment for data collection: the Micro-Vision SpotSeeker III to measure the modulation transfer function, mis-convergence, and pincushioning; a Newport Optical Table to isolate the SpotSeeker and each monitor from external vibration; and a Minolta CRT Color Analyzer CA-100 to measure the maximum usable brightness of each monitor.

The **Average MTF** (modulation transfer function) can be loosely defined as the ratio of contrast to maximum usable brightness; it serves as an indicator of a monitor's sharpness. Large bands of black and white lines appear sharp on most monitors, but as these lines get thinner and more closely spaced, a monitor has difficulty resolving them. A sharp monitor will have a high level of black-and-white contrast when displaying closely spaced lines.

To test this quality, we have each monitor display a pattern of alternating 1-pixel-wide black and white lines in both the vertical and horizontal planes.

This is the most difficult pattern for a monitor to resolve, so we use it as a worst-case scenario. We adjust the contrast and brightness levels to achieve the largest possible MTF and record the result. We then report the average of the horizontal and vertical tests results. Maintaining sharpness is much easier at lower resolutions, so we test at 1,024-by-768, the expected resolution for monitors in this category. Inferior monitors tend to blur this pattern, producing an image with a gray appearance overall. A higher score reflects a better ability to represent fine detail, most noticeable in the crisp display of text. A monitor that has an Average MTF score below 35 percent is not recommended for intensive writing work.

A monitor displays color by lighting any combination of red, green, or blue phosphors, typically using a separate electron beam for each phosphor type. When these beams are misaligned, colored halos appear around on-screen objects. This phenomenon is called misconvergence and is usually most apparent at the corners of the screen, where the electron beams are at their greatest deflection.

Maximum Usable Brightness is a measure of the screen's brightness at the point before the MTF value begins to drop. We use a Minolta Color Analyzer CA-100 to measure the monitor's brightness. Although a maximum usable brightness of 20 or more foot-lamberts is acceptable, a higher number means

WHAT HAPPENS

WHEN YOU ADD **SIZE**

TO AN ALREADY

EXTRAORDINARY PACKAGE?



At 7 feet 2 inches tall, Kareem Abdul-Jabbar has got some serious size. But that's only half the story. The fact that he added superior basketball skills to an already imposing frame is what made him a dominant force in the NBA for two solid decades.

The new ergonomically and aesthetically designed Elite series of monitors from MAG InnoVision have features that other monitors just can't touch. And the fact that they only come in the larger 15-inch, 17-inch and 21-inch sizes with the most advanced CRT technologies makes them truly fantastic. Advance Display Calibration, Green Energy and LCD displays combined with ultra high resolutions up to 1600 x 1280, lightening-quick refresh rates and crystal clear dot pitches make them impossible to beat. And since they're so reliable, we'll even throw in a 3-year limited warranty.

So pick one up at a MAG InnoVision dealer near you. Their larger size and imposing features are liable to dominate the market for years to come and they cost a lot less than, say, an NBA draft pick these days.

WHAT DO YOU THINK?

MAG
INNOVISION



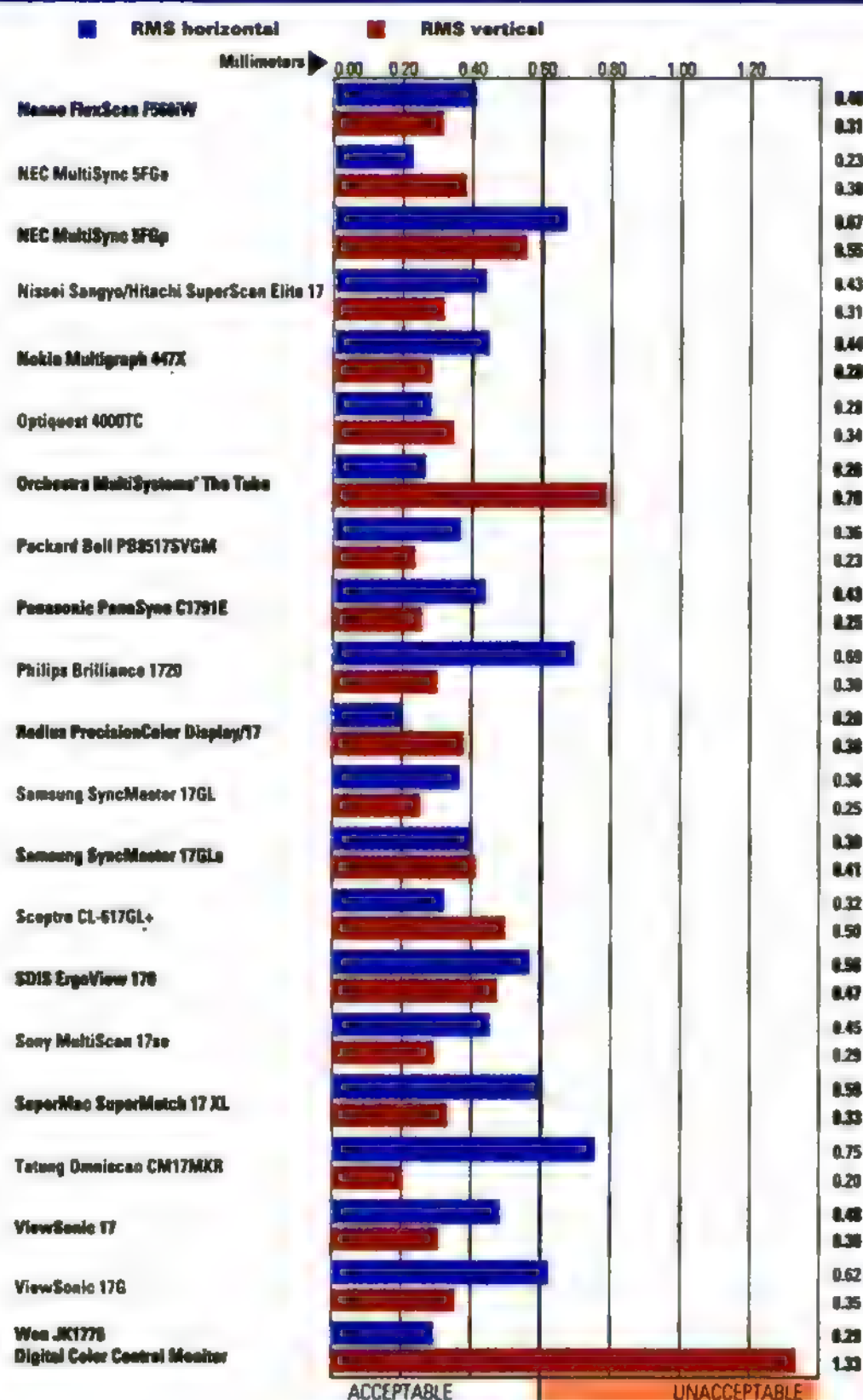
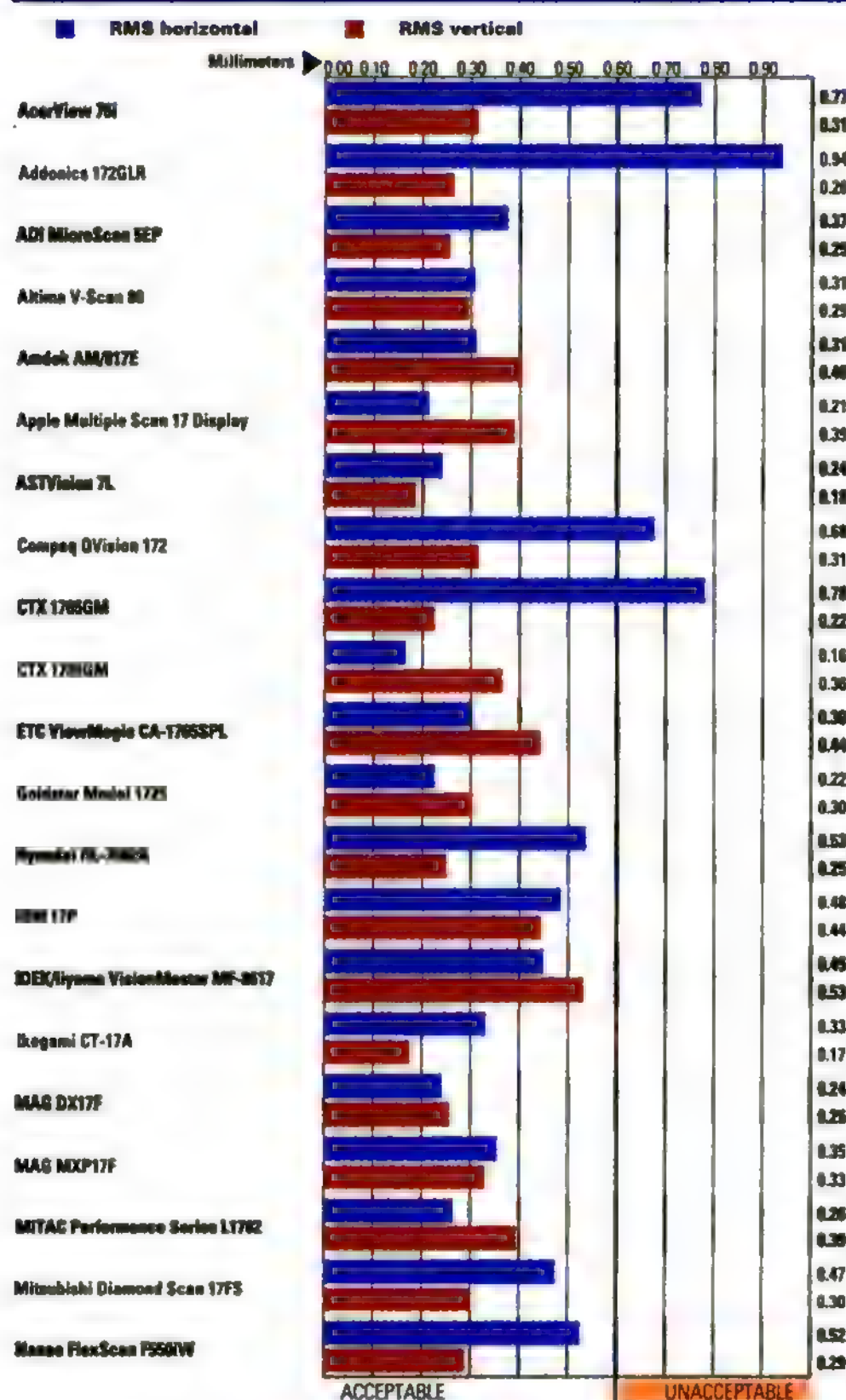
CIRCLE 067 ON READER SERVICE CARD

See Kareem at COMDEX/Fall '94, Booth #L290.

2801 South Yale Street • Santa Ana, California 92704 • 800-827-3998 • 714-751-2008



PINCUSHIONING



that you can fine-tune images more easily for different lighting conditions.

For the **RMS Misconvergence** test, we display two test patterns: five white horizontal lines and five white vertical lines. We measure the beam displacement between red, green, and blue dots within a given line near each corner and at the center of the display. We report the *root mean square* of the results, or RMS misconvergence, in millimeters.

Pincushioning is a measure of how much an on-screen straight line curves or bows. Lines at the edges of the screen tend to exhibit more pincushioning than lines at the center, because of the increased deflection of the electron beam. To test each monitor for vertical and horizontal pincushioning, we display a screen with three vertical lines (one at the center and one on each side of the screen), and then a screen with three horizontal lines (one at the center, one at the top, and one at the bottom of the screen). We measure the displacement at the very edges of these lines and report the root mean square, or RMS pincushioning, in millimeters for both the horizontal and vertical planes.

Note that many of these monitors allow you to adjust the vertical pincushioning. This affects the results in two ways. First, each monitor's horizontal pincushioning is almost always more severe than its vertical pincushioning. Second, because we adjust the vertical pincushioning to produce the best

picture to the eye, the results are influenced by the tester's ability to determine a straight line.

In addition to our standard performance tests, we ran tests to measure a monitor's color tracking (accuracy) and spatial uniformity (a measure of how much the brightness varies across the display). The results of these tests are not shown here but are discussed in the reviews.

For each monitor, ZD Labs used a Minolta Color Analyzer CA-100 to measure the **color temperature** of a white raster pattern. There is no right or wrong color temperature, but screens that have color temperatures greater than 10,000 degrees Kelvin display white with a slightly bluish tint. Screens with color temperatures below 3,000 degrees Kelvin show white that looks yellowish.

Color tracking is a measure of how well the strength of the monitor's three electron guns can remain equal for different shades of gray. ZD Labs used the Minolta Color Analyzer to measure the intensity of each of the three colors (red, green, and blue) as a percentage of their maximum intensity for 16 shades of gray. The percentages were measured with the electron beams varying from 100 percent down to zero percent of their maximum strengths in 32 equal steps.

Spatial uniformity is a measure of how the luminance of a monitor screen

POWER CONSERVATION

Lower numbers represent greater energy efficiency.

	White screen (watts)	Black screen (watts)	Standby mode (watts)	Suspend mode (watts)	Off mode (watts)
AcerView 76i	119.8	91.5	10.0	10.0	1.9
Addonics 172GLR	112.4	84.2	10.4	10.4	1.9
ADI MicroScan 5EP	91.2	64.8	6.2	6.3	2.3
Altima V-Scan 80	104.1	87.6	N/A	N/A	N/A
Amdek AM/817E	124.9	96.6	83.5	18.8	18.9
Apple Multiple Scan 17" Display	107.2	81.0	4.6	4.5	4.6
ASTVision 7L	106.0	82.2	83.4	5.8	5.8
Compaq QVision 172	122.4	85.9	73.3	8.4	5.5
CTX 1765GM	96.5	72.1	18.0	8.0	3.4
CTX 1785GM	97.4	73.8	9.9	10.1	4.2
ETC ViewMagic CA-1765SPL	97.0	73.3	17.0	17.0	17.0
Goldstar Model 1725	84.2	66.6	7.8	7.9	3.4
Hyundai HL-7682A	104.2	92.8	N/A	N/A	N/A
IBM 17P	115.8	84.0	73.9	8.8	6.1
IDEK/Iiyama VisionMaster MF-8617	124.2	100.3	1.8	1.7	1.7
Ilgamit CT-17A	129.9	94.1	N/A	N/A	N/A
MAG DX17F	114.2	83.4	17.5	17.6	4.4
MAG MXP17F	120.1	88.3	29.9	29.8	6.9
MiTAC Performance Series L1782	115.0	88.6	N/A	N/A	N/A
Mitsubishi Diamond Scan 17FS	106.7	78.0	65.2	10.0	5.3
Nanao FlexScan F550iW	100.4	75.7	4.4	6.6	4.3
Nanao FlexScan F560iW	130.3	98.0	8.4	13.1	8.2

N/A—Not applicable. The product does not have this feature.

	White screen (watts)	Black screen (watts)	Standby mode (watts)	Suspend mode (watts)	Off mode (watts)
NEC MultiSync 5FGe	84.6	60.8	56.1	27.8	27.0
NEC MultiSync 5FGp	118.0	84.9	77.8	31.8	31.2
Nissar Sangyo/Hitachi SuperScan Elite 17	96.6	75.5	27.2	27.2	21.2
Nokia Multigraph 447X	121.2	85.3	76.3	9.2	6.3
Optique 4000TC	134.3	87.8	28.1	10.9	1.5
Orchestra MultiSystems' The Tuba	105.5	84.9	N/A	N/A	N/A
Packard Bell PB8517SVGM	120.8	98.1	12.0	12.1	5.9
Panasonic PanaSync C1791E	113.2	94.9	82.7	12.4	6.2
Philips Brilliance 1720	96.3	68.5	5.8	5.8	1.3
Radius Precision Color Display/17	133.0	105.9	17.3	17.2	13.8
Samsung SyncMaster 17GL	80.3	58.9	7.5	7.5	7.4
Samsung SyncMaster 17GLs	82.8	64.2	7.0	6.8	6.8
Sceptre CL-617GL+	103.2	75.6	81.6	4.0	4.0
SDIS ErgoView 170	93.0	68.1	N/A	N/A	N/A
Sony MultiScan 17se	128.0	107.3	17.6	17.3	14.1
SuperMac SuperMatch 17 XL	108.5	83.7	10.9	10.9	1.9
Tatung Omniscan CM17MKR	123.4	93.6	75.9	5.4	5.4
ViewSonic 17	119.0	96.9	9.8	9.8	6.2
ViewSonic 17G	121.1	97.1	11.9	11.9	5.9
Wan JK1775 Digital Color Control Monitor	110.4	85.8	37.8	22.3	1.9

varies across the display. ZD Labs used the Minolta Color Analyzer to measure the luminance of a white raster at 16 positions on each monitor.

We also ran a series of test patterns from Sonera Technologies' Displaymate for Windows to evaluate screen geometry, distortion, resolution, focus, and text readability.

POWER CONSERVATION

We measured power consumption and Energy Star compliance using a Dranetz 8000-2 Energy Analyzer. For a monitor to be compliant with Energy Star power-conservation requirements, it must enter a low-power state, consuming no more than 30 watts after a period of inactivity. A monitor can achieve this using one of two methods: screen blanking or VESA's Display Power Management Signaling (DPMS) specification.

Screen blanking uses a standard screen saver to blank the screen. With the screen blank, the RGB signal to the monitor deactivates. The monitor then senses the interruption of one of the RGB signals (blue in most cases) and cycles through the power-saving modes.

VESA's DPMS uses the horizontal- and vertical-synchronization lines of the monitor to activate the power-saving feature. By reducing or turning off one or both of these signals, the monitor enters into a low-power state or cycles through a number of power-saving modes.

As the monitor enters each new mode, increasing its power savings, it takes longer to recover when awakened. VESA defines three power-saving modes in its DPMS specification:

- **Standby mode** saves about 30 percent of the total energy consumed by the

monitor and allows almost immediate recovery.

- **Suspend mode** increases the power savings by turning off the power used to heat some of the CRT components; it requires up to 5 seconds to recover.

- **Off mode** offers the maximum power savings possible (with most implementations of the DPMS specifications) by supplying power to the monitor's microprocessor only. Recovery from here is a cold start.

The first two scores we report on the accompanying table were recorded by setting Windows to display a white screen and a black screen, each at 1,024-by-768 resolution, running at a vertical refresh rate of 72 Hz. These two scores represent the power consumed during "normal" monitor use and software-based screen blanking.

All but six of the 42 monitors we tested were Energy Star-compliant (as noted on the Summary of Features table). The remaining 36 units followed the VESA DPMS specification for signaling power-saving mode; 6 of these monitors also supported screen blanking as a trigger for power saving. When screen blanking was in effect, all of the monitors showed power consumption that was reduced by an average of 20 to 25 percent.

Only one of the monitors that claimed Energy Star compliance, the NEC MultiSync 5FGp, did not meet the Energy Star requirement of using no more than 30 watts, though it was not far off: It consumed 31.2 watts in its maximum power-saving mode. The NEC MultiSync 5FGe (at 27 watts) came close to missing the 30-watt mark as well. NEC Technologies is in the process of revising its MultiSync monitor line; by early fall, the company expects to ship a series of 15- to 21-inch monitors designed for high-end use.

Philips Shatters In Monitor

Introducing Philips Brilliance™ 21A With CyberScreen® Technology.

Your on-screen image looks perfect on the Philips Brilliance™ 21A monitor. Because Philips' revolutionary new CyberScreen® technology digitally corrects beam convergence, color and brightness to *all* points on screen.

With conventional correction, lines deteriorate from the center to the edge. This is due to beam misconvergence, which may be as much as .45 mm in the corners. Color and brightness may also vary as much as 25% from center to edge.

CyberScreen® reduces beam misconvergence to <.2 mm over the entire screen, even to the edges—a 55% improvement! Philips' patented magnetic compensation circuitry assures perceptually perfect convergence, geometry, brightness and color uniformity from edge to edge.

Conventional monitors are sufficient for some applications. But when your application demands perfection, choose the only monitor that delivers perfection—Philips Brilliance™ 21A with CyberScreen® technology.

Call 1-800-835-3506
In Canada, 1-800-387-0564



Another First From Philips



PHILIPS

The Status Quo Technology.



CyberScreen®
TECHNOLOGY

CIRCLE 006 ON READER SERVICE CARD

BRILLIANCE™
HIGH RESOLUTION MONITORS

17-Inch Monitors

and graphics applications, but business users may find that it delivers the balance of price and performance they require.

This monitor's biggest selling point may be its on-screen programming controls. You can toggle through three control menus and easily change settings, including trapezoidal adjustment and color accuracy. Though manufactured by Acer, the AcerView 76i can also be found under a few other vendor names, including the Optquest 4000DC (\$1,299 list, \$799 street).

Acer's 24-hour, 7-day technical support is a welcome offering, but unfortunately the monitor comes with only a one-year warranty.

► **AcerView 76i.** Estimated street price: \$849. Acer America Corp., 2641 Orchard Pkwy., San Jose, CA 95134; 800-368-2237, 408-432-6200; fax, 408-922-2953.

Circle 485 on reader service card

Addonics, a division of Fora International Corp.

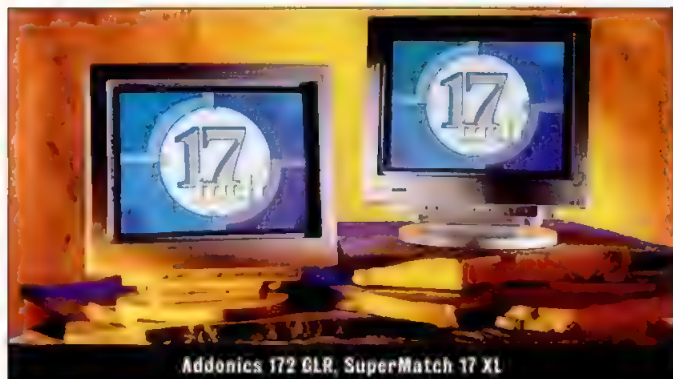
► Addonics 172 GLR

SuperMac Technology Inc.

► SuperMatch 17 XL

BY KATIE BARNES

The Addonics 172 GLR and SuperMac Technology's SuperMatch 17 XL are nearly identical monitors constructed around the same Matsushita 17-inch flat-square tube. List priced at \$1,049 (\$825 street price), the SuperMatch barely achieved average scores on most of our tests and is acceptable primarily for light-duty office applications. The bargain-basement Addonics unit (\$699 list, \$659 street) was often among the worst on our tests but might be acceptable if price is your overriding concern.



Addonics 172 GLR, SuperMatch 17 XL

Both the Addonics and the SuperMatch delivered a sharp, bright image overall, with above-average MTF scores. But the Addonics had obvious pincushioning and misconvergence at the edges of the display. The SuperMatch looked slightly better than the Addonics but still earned slightly worse-than-average pincushioning and misconvergence test scores.

Both monitors showed bright, well-saturated colors with good tonality. But since no color adjustments are available, you are stuck with the factory-set color temperatures. The Addonics had a high color temperature, imparting a bluish tint to the screen; the SuperMatch was set to a "natural" white like the color of paper.

Both monitors offer the same basic brightness, contrast, and positioning controls, plus pincushioning and trapezoidal adjustment. Although easy to use, these controls are hard to see because they are hidden below the bottom lip of the bezel. No on-screen controls are offered.

Both monitors have power-saving capabilities and are VESA DPMS-compliant, but only the Addonics offers the software necessary to invoke these savings without an Energy Star computer system. The Addonics also has a two-year warranty, while the SuperMatch's warranty is only for one year.

Neither the SuperMatch nor the Addonics could be characterized as much more than adequate. If you can overlook the misconvergence and pincushioning problems on the Addonics, however, its low price makes it the better deal.

► **Addonics 172 GLR.** List price: \$699. Addonics, a division of Fora International Corp., 30 W. Montague Expwy., San Jose, CA 95134; 800-336-3962, 408-943-0100; fax, 408-943-0714. Other 17-inch model: Addonics 173 LR, \$849.

Circle 486 on reader service card

► **SuperMatch 17 XL.** List price: \$1,049. SuperMac Technology Inc., 215 Moffett Park Dr., Sunnyvale, CA 94089; 408-541-5500.

Circle 487 on reader service card

ADI Systems Inc.

► MicroScan 5EP

BY BRIAN FIKES

Above-average performance, a good feature set, and a winning price make ADI Systems' MicroScan 5EP one of the better buys in this roundup. With a street price of only \$769, this unit is ideal for business users looking to move up from a 15-inch monitor without feeling sticker shock.

The MicroScan scored well above average on all our performance tests except two: Its MTF scores ranked in the bottom quarter of the pack, and color accuracy was below average. Still, the picture's



focus was sharp; only very small fonts (6 points or less) were difficult to read.

Despite its bright screen, the MicroScan is one of 11 monitors reviewed here that uses less than 100 watts for a full-white display. It is compliant with VESA DPMS and comes with software to activate its DPMS features even if your system isn't Energy Star-certified and you do not have a VESA DPMS-compliant adapter.

The MicroScan has plenty of controls for a low-priced monitor, including pincushioning and trapezoidal, color, and tilt adjustments, but no on-screen controls.

At 1,024-by-768 resolution, the MicroScan has a flicker-free refresh rate of 76 Hz, though the unit's 15.5-inch maximum viewable screen size is slightly smaller than that of the average 17-inch monitor.

► **MicroScan 5EP.** Estimated street price: \$769. Other 17-inch model: MicroScan 5AP, \$859. ADI Systems Inc., 2115 Ringwood Ave., San Jose, CA 95131; 800-228-0530, 408-944-0100; fax, 408-944-0300.

Circle 488 on reader service card



Monitor disk space down the hall.



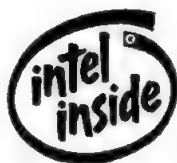
Check error logs and diagnose your server across campus.



Power cycle the server in Kalamazoo.



Open a window on the world.



HP NetServer LM • 90- and 66-MHz Intel Pentium™ processor, 66-MHz Intel486™ DX2 processor • Dual Intel Pentium 66-MHz Symmetric Multiprocessing (SMP) • Optional internal hot swap disk array (RAID 0, 1, 5, 6) and ECC memory • HP NetServer Assistant 2.0 included • 16-MB RAM standard, 384-MB maximum • Up to 256-KB write-back cache • 9 mass storage shelves • 8 EISA bus-master I/O slots • Integrated EISA Fast SCSI-2, IDE and video controllers • Designed-in security, serviceability, and cooling features • Tested and certified on all major network operating systems

HP NetServer LF • 66-MHz Intel Pentium processor, 100-MHz IntelDX4 processor, 66-MHz Intel486 DX2 processor • Automatic Server Restart • HP NetServer Assistant 2.0 included • Optional internal hot swap disk array (RAID 0, 1, 5, 6) • 8-MB and 16-MB RAM standard, 192-MB maximum • 256-KB write-back cache • 9 mass storage shelves • 2 PCI, 7 EISA bus-master I/O slots • Integrated EISA Fast SCSI-2, IDE and video controllers • Designed-in security, serviceability, and cooling features • Tested and certified on all major network operating systems

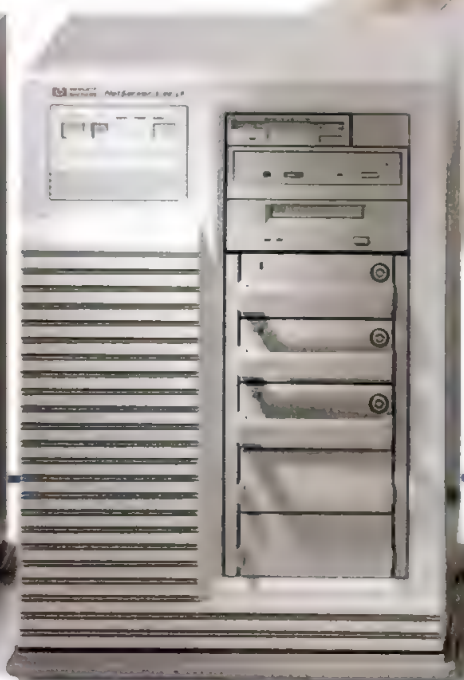
HP NetServer LC • 66-MHz Intel Pentium processor, 100-MHz IntelDX4 processor, 66-MHz Intel486 DX2 processor • Automatic Server Restart • 8-MB and 16-MB RAM standard, 192-MB maximum • Up to 256-KB write-back cache • 1 PCI, 1 PCI/EISA-combo, 4 EISA I/O slots • 5 mass storage shelves • Integrated EISA Fast SCSI-2, IDE and video controllers • Designed-in security, serviceability, and cooling features • Tested and certified on all major network operating systems

Management Solutions: HP Remote Assistant • \$999† for intelligent EISA card and software • Complete remote control of server • Continual environmental and server hardware monitoring and error logging • Automatic Server Restart • Works on all major network management environments **HP NetServer Assistant 2.0** • Included with HP NetServer LM and LF, \$495† option for HP NetServer LC • A customizable server management software tool set • Proactive system/component alerting and status information • Includes HP OpenView 7.1 • Comprehensive troubleshooting tools

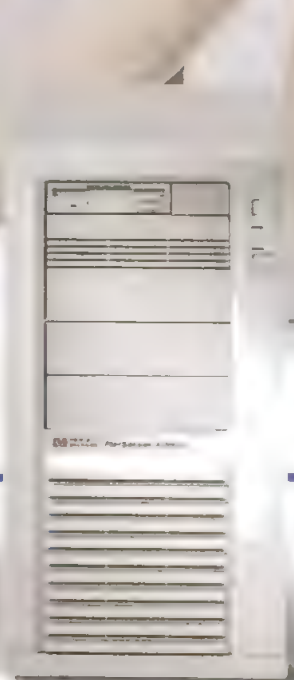
HP Service and Support • A full range of support service from HP or HP-authorized resellers • Three-year, on-site, next-business-day limited warranty standard on all products; affordable upgrades to same-business-day or 24-hour, 7-day, 4-hour response • Complete technical and support information available through a wide range of media • HP Support Assistant CD-ROM subscription; fax-back service; BBS; CompuServe forum and telephone support



HP NetServer LM from \$4,449*



HP NetServer LF from \$3,249**



HP NetServer LC from \$2,529***

Now you can be everywhere at once. Without going anywhere.

HP NetServers are easy to manage even when you're not there.

With today's increasingly complex networks, it seems LAN managers depend more on their beepers and the corporate travel office than anything else. Go here, go there, fix this, fix that. Leaving no time for the kind of proactive work that could avert trouble in the first place.

Maybe that's why so many network administrators are turning to the affordably priced lineup of HP NetServers. Take a quick look, and you'll find optimized price/performance servers to match every need. But you'll also discover how to answer your need for servers that are easier to manage.

HP NetServer Assistant software helps you prevent problems before they occur—and gives you tools to resolve them if they do. And because it supports the HP OpenView platform, you can access your entire network from a single console. With HP Remote Assistant, you can manage the server from anywhere, even if it's down. Even if the network's down.

Performance? You can choose from single and dual Pentium™ models, as well as those with Intel486™ DX2 and DX4 processors. For compute-intensive applications, you'll want to look at the HP dual Pentium Symmetric Multiprocessing model. Whatever you select, you'll enjoy maximized uptime, thanks to RAID-based fault tolerance, hot swappable drive replacement and error checking and correcting memory.

Perhaps best of all, HP NetServers come to you from the company with an unparalleled

reputation for quality, reliability and support—Hewlett-Packard. Which is undoubtedly why we can offer one of the industry's best warranties: three-year, next-business-day, on-site delivered by HP or your reseller.

For more information on

HP NetServers, call us today at 1-800-533-1333, Ext. 8439. And the next time you feel a need to go somewhere, make it a vacation.

Another smart networking product from HP.



With HP NetServer Assistant 2.0, you get intuitive viewing of your network, comprehensive diagnostics, plus local and remote management, all in one package.



**HEWLETT®
PACKARD**

17-Inch Monitors

Altima Systems Inc.

• Altima V-Scan 80

BY BRIAN FIKES

With its better-than-average performance and list price of \$999, the Altima V-Scan 80 is a good value. It is also one of the few monitors reviewed here that can handle 1,024-by-768 at a flicker-free 90 Hz.

The V-Scan had above-average MTF and pincushioning scores, and our subjective analysis confirmed that the entire screen is sharp with very little geometric distortion. Color quality was good, if not particularly vivid, and the maximum us-

*The Altima V-Scan 80
is one of the few
monitors reviewed here
that can handle 1,028-
by-768 resolution at a
flicker-free 90 Hz.*

able brightness was below average but still acceptable.

The V-Scan doesn't offer energy-saving options, and its size and positioning controls could only make coarse adjustments. It does offer color and pincushioning adjustments, though software-based on-screen controls are not available. The BNC and DSUB inputs allow you to connect the V-Scan to two computers and switch between them. You can order the monitor in a black case instead of the standard office beige.



The Altima V-Scan 80 represents a fine balance of price, performance, and features. If you're looking for a general-purpose monitor that can handle higher resolutions, this is a good choice.

► **Altima V-Scan 80.** List price: \$999. Altima Systems Inc., 2440 Stanwell St., Concord, CA 94520; 800-356-9990, 510-356-5600; fax, 510-356-2408.

Circle 489 on reader service card

Amdek, a division of Wyse Technology Inc.

• AM/817E

BY BRIAN FIKES

With a reasonable list price of \$799, Amdek's AM/817E monitor delivers good overall picture quality for everyday business applications. It was one of the better performers on our RMS Misconvergence test and scored average or slightly better on our Average MTF and Pincushioning tests.

The Amdek's brightness score was slightly below average, but its uniform picture should be fine under most lighting conditions.

In subjective testing, we found that the Amdek did not have the well-saturated colors needed for high-end graphics work, and the picture seemed unstable at the right edge of the screen. The silica coating used to combat glare was adequate but tended to reflect bright objects in the room, causing the text to look slightly out of focus.

The Amdek offers a comprehensive mix of front-panel digital and analog controls, including pincushioning, tilt, and color adjustments. We found them easy to use, but they adjusted in such large increments that fine-tuning was difficult. No on-screen controls are offered.

The Amdek is both Energy Star-certified and VESA DPMS-compliant, but no energy-saving software is offered. That means you'll need a DPMS-compliant adapter, an Energy Star-certified PC, or a third-party screen saver that handles DPMS signals to take advantage of the unit's power-saving capability.

The Amdek V-Scan 80 is a practical, no-frills monitor that should prove to be adequate for most mainstream business users.

► **AM/817E.** List Price: \$799. Amdek, a division of Wyse Technology Inc., 3471 N.



1st St., San Jose, CA 95134; 800-722-6335, 408-473-1200; fax, 800-742-6335.

Circle 490 on reader service card

Apple Computer Inc.

• Apple Multiple Scan 17 Display

BY BRIAN FIKES

With a list price of \$1,069, the Trinitron-based Apple Multiple Scan 17 Display is one of the few monitors that came in well above average on both SpotSeeker and color analyzer tests. Its picture was sharp and free of distortion (even small fonts were readable), and its color accuracy was good, making this model a viable choice for even the most demanding DTP professional. Brightness was slightly above average.

The Apple has a maximum resolution of 1,280-by-1,024, but can only deliver that resolution at a low 60-Hz refresh rate. This should not prove a handicap, however, as anything over 1,024-by-768 in a 17-inch display is impractical for most Microsoft Windows users.

The Apple comes with a comprehensive set of front-panel digital controls, including tilt adjustment, convergence, and color temperature. Its Mac duality is evidenced by its three ADB ports and documentation aimed at Macintosh users; a four-page addendum provides most of the additional information that a PC user would need.

Perhaps the biggest drawback for users of PC-compatible systems is that the software for setting controls and power saving on-screen is available only for the Apple Macintosh. You can still set the screen controls manually, however, and power saving is compliant with the VESA DPMS standard.

GET THE ULTIMATE 17" MONITOR WITHOUT PAYING THROUGH THE EYES.

For many, a 17" monitor represents a step up in size, but not necessarily a step up in image quality. Unless you are stepping up to the new Nokia Multigraph™ 447X.

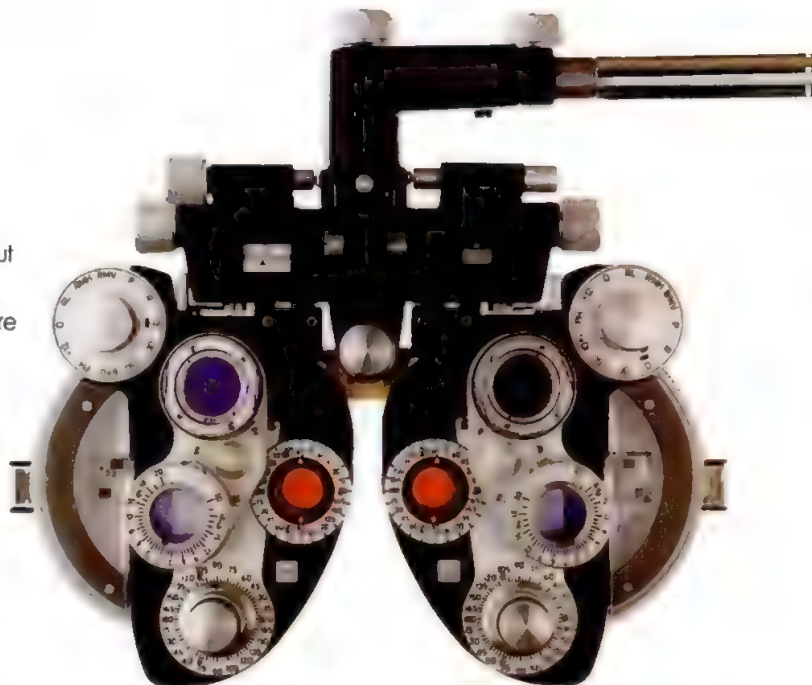
First there is the crispness of its .26mm aperture grill. When presented in its maximum resolution of 1600 x 1200, you enjoy a working environment of phenomenal richness, clarity, and detail. Invoke the maximum refresh rate of 120 Hz, and you possess a

MAXIMUM REFRESH RATE FOR EACH RESOLUTION						
RESOLUTION	640x480	800x600	1024x768	1152x870	1280x1024	1600x1200
447X — 17"	120Hz	120Hz	90Hz	80Hz	75Hz	62Hz

screen so stable it appears frozen in time. And when you select Nokia's exclusive MicroEmission™ option, this exquisite display represents the most user-sensitive 17" monitor in the world—easily surpassing the rigorous health and environmental criteria of TCO*.



447X with MicroEmission™ option
Max. resolution 1600 × 1200
Max. refresh 120 Hz
TCO 92 compliant



and sparing your eyes the strain of hours spent in front of a lesser system. You will also be acquiring conveniences like on-screen adjustments for 19 different user-defined preferences, including FullScreen™ borderless display. You should find the price fits comfortably with your preferences as well.

Call 1-800 BY NOKIA for the dealer nearest you. And see the latest in European eye care.

NOKIA
CONNECTING PEOPLE
NOW AVAILABLE AT CompUSA



© 1994 Nokia Display Products, Inc. Multigraph, MicroEmission and FullScreen are trademarks of Nokia Display Products, Inc. *TCO is The Swedish Confederation of Professional Employees. All other trademarks are the sole property of their respective companies. The Energy Star emblem does not represent EPA endorsement of any product or service.

Buying a system? Sure, you want price and performance. Support? Too often it's an afterthought.

Problem is, too many direct-order companies treat support the same way. They make the sale, then disappear.

At AMBRA,TM we'd rather build a long-term relationship with our customers. So before we sold a single PC, we enlisted the best service organization in the business: IBM.[®]

Whenever you need help, we've got IBM computer experts—not switchboard operators—standing by. Toll-free,

24 hours a day, 7 days a week. And, every system carries one-year IBM onsite technical service.

It's for reasons like these that *InfoWorld* (4/25/94) says, "AMBRA has been able to offer good support and customer service as well as good prices."

All good reasons to buy from AMBRA.

THE AMBRA ASSURANCE

- ▲ Toll-free IBM technical support, available 24 hours, 7 days a week.
- ▲ 30-day, airtight, money-back guarantee.
- ▲ One-year warranty on parts and labor.
- ▲ All Blue LightningTM systems are rigorously tested.



100MHz AT

IBM BLUE LIGHTNING:

Your WindowsTM apps need speed, while you need something to fit your budget.

Here's a solution that's a bolt from the blue: the D4100BL from AMBRA.

It takes advantage of IBM's Blue Lightning 100MHz processor. With clock-tripling technology, it boosts speed without heating up the price.

PC World named our 66MHz Blue Lightning a "Best Buy." Guess that makes our 100MHz an even *better* best buy.

You want one, you better get on the horn. They're going as fast as they run.

D466BL NOW \$1399

Business Lease: \$49/Month

- ▲ 486/66MHz Blue Lightning
- ▲ Upgradable to PentiumTM Technology
- ▲ 16KB L1 and 256KB L2 Cache
- ▲ 4MB RAM, Max: 64MB
- ▲ 212MB Enhanced IDE CaviarTM Hard Disk Drive
- ▲ 15" FST-NI Color Monitor-LR (13.6" viewable screen size)
- ▲ VESA[®] Local Bus Graphics Accelerator 1MB
- ▲ Integrated 32-bit SCSI-2 Controller
- ▲ 3 16-bit ISA and 2 32-bit VESA Bus Slots
- ▲ 3.5" 1.44MB Diskette Drive
- ▲ 5 Drive Bays
- ▲ Integrated Ethernet-10BaseT
- ▲ LexmarkTM 101-Key Keyboard
- ▲ MS-DOS[®] 6.2, Windows 3.1, Mouse

D4100BL NOW \$1699

Business Lease: \$60/Month

- ▲ 486/100MHz Blue Lightning
- ▲ Upgradable to Pentium Technology
- ▲ 16KB L1 and 128KB L2 Cache
- ▲ 4MB RAM, Max: 64MB
- ▲ 212MB Enhanced IDE CaviarTM Hard Disk Drive
- ▲ Double-Speed Multisession CD-ROM Drive
- ▲ 15" FST-NI Color Monitor-LR (13.6" viewable screen size)
- ▲ VESA Local Bus Graphics Accelerator 1MB
- ▲ VESA Local Bus IDE Hard Drive Controller
- ▲ 4 16-bit ISA and 1 32-bit VL Bus Slots
- ▲ 3.5" 1.44MB Diskette Drive
- ▲ 5 Drive Bays
- ▲ Lexmark 101-Key Keyboard
- ▲ MS-DOS[®] 6.2, Windows 3.1, Mouse



CALL NOW and get an upgrade on any CD-ROM system to multimedia with 16-bit sound card and 2 stereo speakers for only \$49.



©1994 AMBRA Computer Corporation. The AMBRA logo and logotype are trademarks of AMBRA Computer Corporation. AMBRA is a trademark of ICPI Ltd. and used under license therefrom. All other brands and product names are registered trademarks, trademarks or service marks of their respective holders. Please call for details regarding AMBRA's money-

66MHz PRICES.

A BOLT FROM THE BLUE.

Winbench 4.0				
	DOSmark	Graphics WinMark	Disk WinMark	Winstone
Blue Lightning 100MHz ¹	719.9	9.76	1243	58.7
486DX2/66 Average ²	592.7	9.50	861	49.5

D4100BL NOW \$2099

Business Lease: \$74/Month

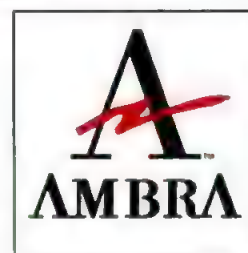
- 486/100MHz Blue Lightning
- Upgradable to Pentium Technology
- 16KB L1 and 256KB L2 Cache
- 8MB RAM, Max: 64MB
- 420MB Enhanced IDE Caviar Hard Disk Drive
- Double-Speed Multisession CD-ROM Drive
- 15" FST-NI Color Monitor-LR (13.6" viewable screen size)
- VESA Local Bus Graphics Accelerator 1MB
- VESA Local Bus IDE Hard Drive Controller
- 4 16-bit ISA and 1 32-bit VL Bus Slots
- 3.5" 1.44MB Diskette Drive
- MS-DOS 6.2, Windows 3.1, Mouse
- Borland Office™ on CD¹ (WordPerfect®, Quattro® Pro, Paradox®)



Desktop model shown. Mini-tower and other configurations also available.

1 800-200-3197

1. 3-year warranty and credit terms. Lease based on 36 months, offered by IBM Credit Corp. Onsite service may not be available in certain locations. Offerings may differ in Canada. Prices do not include shipping. Return shipping and insurance charges are the responsibility of the customer. *AMBRA results independently tested 1/11/94. ²From PC Magazine, December 7, 1993. ³All manuals are on the CD. Printed manuals can be purchased directly from Borland and WordPerfect.



17-Inch Monitors



Apple Multiple Scan 17 Display

► **Apple Multiple Scan 17 Display.** List price: \$1,069. Apple Computer Inc., 1 Infinite Loop, Cupertino, CA 95014; 800-538-9696 ext. 525, 408-996-1010; fax, 408-974-9974.

Circle 491 on reader service card

AST Research Inc.

• ASTVision 7L

BY KATIE BARNES

The ASTVision 7L's performance was inconsistent. Vertical and horizontal pincushioning scores were excellent, while the Average MTF and RMS Misconvergence scores were about average. But maximum usable brightness was near the bottom of the pack, and in our subjective evaluations text appeared slightly muddy. Screen uniformity was also below average, and stability problems at the right edge of the display were readily visible. If you plan to spend long hours staring at your screen, the ASTVision (\$915 list)



ASTVision 7L

The Apple Multiple Scan's front panel includes tilt, color temperature, and convergence controls. Brightness and contrast buttons double as other controls, with LEDs indicating which adjustment is being changed.

► **ASTVision 7L.** List price: \$915. AST Research Inc., 16215 Alton Pkwy., Irvine, CA 92718; 800-876-4278, 714-727-4141; fax, 800-926-1278.

Circle 491 on reader service card

Compaq Computer Corp.

• QVision 172

BY KATIE BARNES

The Compaq QVision 172 (\$1,069 list) should prove adequate for most business users, but better performance can be had for less money. The QVision's biggest fault is its antiglare treatment, which gives the display a foggy appearance and makes focusing difficult. Images looked dull even though the brightness of the screen was well above average.

On the positive side, the Trinitron-equipped QVision offers a welcome 76-Hz refresh rate at 1,280-by-1,024 and 1,024-by-768 noninterlaced resolutions.



Compaq QVision 172

may not be the monitor for you.

The ASTVision offers basic brightness, contrast, and positioning controls, plus pincushioning, but has no ability to set them on-screen. It is compliant with both the Energy Star and the VESA DPMS standards, though you'll need a compliant PC or video card to activate the monitor's power-saving features. AST offers 24-hour customer

The display was exceptionally uniform and showed good color tonality and saturation. The QVision was also adept at mode-switching between DOS and Microsoft Windows; only a slight bounce was detected. RMS Misconvergence and horizontal pincushioning scores, however, were below average.

The QVision comes with a complete set of easy-to-use front-panel controls, including pincushioning, tilt, convergence, and color-matching adjustments. Compaq does not offer on-screen controls, however, and the warranty is only for one year. The included documentation is comprehensive and well written. Compaq offers this unit as an option with its PC systems. ► **QVision 172.** List price: \$1,069. Compaq Computer Corp., P.O. Box 692000, Houston, TX 77269-2000; 800-345-1518, 713-370-0670.

Circle 493 on reader service card

CTX International Inc.

• CTX 1765GM

• CTX 1785GM

BY BRIAN FIKES

If you're looking for decent picture quality at a moderate price, CTX International has two monitors for you. The CTX 1765GM (\$749 street, \$999 list) performed generally below average, and its score of 0.78 mm on our horizontal pincushioning test is in the unacceptable range; still, we found its picture acceptable for most applications. The CTX 1785GM (\$849 street, \$1,049 list) is also moderately priced, with above-average performance.

The premium you pay for the CTX 1785GM gets you a slightly smaller dot pitch (0.26 mm, versus the 1785GM's 0.27 mm) and a higher refresh rate (75 Hz at 1,280-by-1,024, versus 60 Hz for the 1765GM). The CTX 1785GM also adds BNC and DSUB input connections so you can connect two computers and switch between them.

The higher-priced CTX 1785GM had excellent RMS Misconvergence and horizontal pincushioning scores on our tests and, despite its lower Average MTF score, displayed slightly more legible text at small font sizes than the CTX 1765GM did. Both models had good color accuracy and spatial uniformity and adequate maximum usable brightness, though images on both monitors were compressed horizontally

17-Inch Monitors

near the left and right edges of the screen.

These monitors have plenty of front-panel controls, including pincushioning, trapezoidal, tilt, and color adjustments. Each also has power-saving features compatible with both VESA DPMS and screen blanking, so you don't need a "green PC" to save

recommend despite its bargain-basement street price of \$650 (\$699 list). The ViewMagic proved adequate on our brightness and pincushioning tests, but its bottom-of-the-pack RMS Misconvergence and Av-



Front-panel controls are abundant and easy to use on the CTX 1785GM and 1785GM. Besides the usual contrast, brightness, size, and positioning, you get pincushioning, trapezoidal, tilt, and color adjustments.



CTX 1785GM and CTX 1785GM

energy. Both CTX monitors have features you might not expect at these prices. Their geometric distortion makes them unsuitable for high-end graphics or CAD work, but any cost-conscious business or home user should find their performance perfectly adequate.

► **CTX 1765GM.** List price: \$999. **CTX 1785GM.** List price: \$1,049. CTX International Inc., 20530 Earlgate St., Walnut, CA 94789; 800-888-2012, 909-595-6146; fax, 909-595-6293.

Circle 494 on reader service card

ETC Computer Inc.

• ViewMagic CA-1765SPL

BY STEPHEN CHAN

The ViewMagic CA-1765SPL's poor-to-mediocre performance on both our objective and subjective tests makes it tough to

erage MTF scores reflected blurred text and graphics.

On the plus side, on-screen controls are plentiful and easy to operate, with helpful color icons and bar-graph indicators. Another welcome feature is the monitor's ability to hold four different control settings in memory at 60 Hz and three settings at 72 Hz; this is useful for switching quickly between different brightnesses or color temperatures.

A sibling offering from ETC, the ViewMagic CA-1765CPL (also \$699), differs from the reviewed unit only in the use of an LED readout instead of the on-screen controls. ETC offers a two-year warranty. ► **ViewMagic CA-1765SPL.** List price: \$699. Other 17-inch model: ViewMagic CA-1765CPL, \$699. ETC Computer Inc., 2917 Bayview Dr., Fremont, CA 94538-6520; 510-226-6250; fax, 510-226-6252.

Circle 495 on reader service card

Goldstar USA Inc.

• Goldstar Model 1725

BY JOHN R. QUAIN

Like other 17-inch monitors in this moderate price range, the Goldstar Model 1725 (\$899 list, \$849 street) has less sophisticated features than the more expensive brands and presents a somewhat mixed performance picture. But mainstream business users looking for an af-



Goldstar Model 1725

fordable way to move up to a 17-inch display should find the Goldstar very acceptable.

The Goldstar turned in the third-best overall RMS Misconvergence score and excellent pincushioning results, so image symmetry was not a problem. Noticeable shortcomings included below-average brightness and a lack of sharpness, which made closely spaced text difficult to read at 1,024-by-768 resolution. Moiré patterns were also an issue, with tightly spaced lines providing some difficulties for this monitor.

The Goldstar comes with all the standard trimmings: Energy Star and VESA DPMS compliance, an MPR II rating, and a decent supply of analog and digital controls, including pincushioning and trapezoidal adjustment. No on-screen controls are offered, however, and you can't adjust color. The Goldstar can display high-resolution images at 1,280-by-1,024, but only at 60 Hz. It also lacks BNC connections for high-end graphics adapters.

► **Goldstar Model 1725.** List price: \$899. Goldstar USA Inc., 1000 Sylvan Ave., Englewood Cliffs, NJ 07632; 201-816-2000; fax, 201-816-0636.

Circle 496 on reader service card

Hyundai Electronics America

• Hyundai HL-7682A

BY STEPHEN CHAN

With a street price of \$899 (\$1,439 list), the Hyundai HL-7682A is acceptable for mainstream business users, but better 17-inch monitors are available at lower prices. Though its focus, brightness, and color are adequate, the Hyundai was below average on almost all our tests.

Two features that piqued our interest were the Hyundai's control panel and signal inputs. The control panel slides out



ETC ViewMagic CA-1765SPL



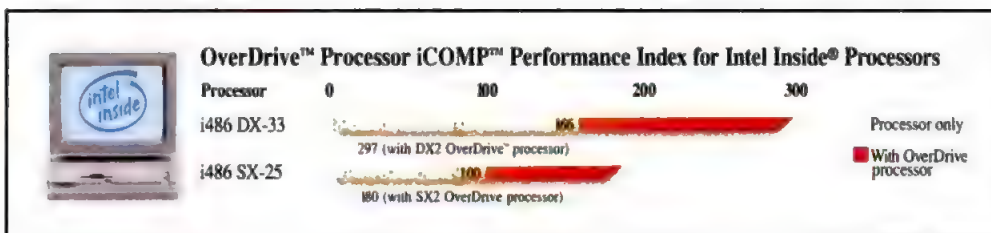
CPU upgrade.

OverDrive™ processor, a family of single-chip upgrades that significantly boosts the overall performance of your Intel486™ SX and DX processor-based PCs.

Slow performance.

Your software is bogged down, but you can't buy a new PC right now.

To speed up your 486,





Call 1-800-538-3373, ext. 178.[†]
To find out more about the IntelSX2™
and IntelDX2 OverDrive processors
and to receive a free demo disk.

Speeds up software.

Microsoft Excel® 4.0 runs 83% faster and
Microsoft Word® 2.0 65% faster when you
upgrade a i486™ SX-33 processor with an
IntelDX2™ 66 MHz OverDrive processor.

[†]For European residents, call +44 (0) 793 431155, and ask for infopack IOD16.
© 1994 Intel Corporation. *Other brands and names are the property of their
respective owners.

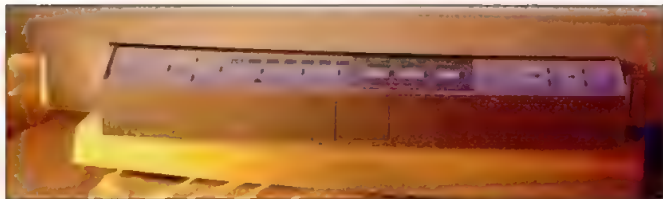
follow the upgrade path.



OverDrive™ processor family of products

intel®

17-Inch Monitors



Hyundai HL-7682A

like a little drawer, exposing controls on a horizontal surface, and all buttons and indicators are clearly labeled. In addition to standard brightness, contrast, and positioning controls, you also get pincushioning, color matching, and trapezoidal and tilt adjustments. No on-screen controls are offered, however. Two signal inputs (a BNC and a 15-pin connector) let you attach two computers to the Hyundai.

► **Hyundai HL-7682A.** List price: \$1,439. Hyundai Electronics America, 166 Baypointe Pkwy., San Jose, CA 95134; 800-627-7978, 408-473-9200; fax, 408-473-9398. Circle 497 on reader service card

IBM Personal Computer Co.

• IBM 17P

BY JOHN R. QUAIN

The IBM 17P is one of the more expensive monitors in this review (\$1,199 list), but its picture and color quality are good enough that graphics and DTP profes-



IBM 17P

The Hyundai HL-7682A's control panel slides out, revealing a hefty supply of clearly labelled controls. In addition to the usual suspects, you get pincushioning, color matching, and trapezoidal and tilt adjustments.

bright and crisp. Color quality is also very good, and the color controls and excellent brightness work to improve that impression. The Sony Trinitron tube of the IBM can be pushed to a maximum noninterlaced resolution of 1,360-by-1,024, with good refresh rates at all resolutions.

The IBM 17P comes with VGA and BNC connections and a full array of front-panel digital controls, including color correction, pincushioning, convergence, and barreling. On-screen controls are not offered, however.

With a three-year warranty and compliance with the MPR II, Energy Star, and VESA DPMS standards, the IBM 17P is a solid display choice.

If you want additional convenience, though, consider the Nokia Multigraph 447X, which offers comparable performance and a handy on-screen control display.

► **IBM 17P.** List price: \$1,199. Other 17-inch model: IBM 17V, \$999. IBM Personal Computer Co., Route 100, Somers, NY 10589; 800-772-2227; fax, 800-426-4329.

Circle 498 on reader service card

sionals may consider the price worthwhile.

Built by Nokia Display Products for IBM, the 17P bears many of the solid performance characteristics of the Nokia Multigraph 447X reviewed in this feature. The IBM 17P produced below-average but acceptable MTF and pincushioning scores. Still, geometric accuracy never strayed far, and the image remained

IDEK/Iiyama North America Inc.

• IDEK/Iiyama VisionMaster MF-8617

BY KATIE BARNES

Excellent refresh rates, a sharp display, and plentiful controls make the IDEK/Iiyama VisionMaster MF-8617 (\$799) a good value for business users. Nonexemplary color quality makes it ill-suited for high-end color graphics applications.

The VisionMaster delivers a refresh rate of 80 Hz up to 1,280-by-1,024 resolution, which is more than most users will need. That and its generally sharp display make it an excellent choice if you plan to work long hours on text-intensive files.

The VisionMaster's front panel offers more controls than you would expect to find for this price. In addition to the usual suspects (brightness, contrast, positioning), you get pincushioning, trapezoidal, rotation, tilt, and color adjustments. We did a lot of toggling to get the settings we wanted, but 21 user-definable stored settings guarantee that you'll need to adjust for each resolution only once. The VisionMaster complies with both the Energy Star and VESA DPMS standards and comes with a three-year warranty.

► **IDEK/Iiyama VisionMaster MF-8617.** List price: \$799. IDEK/Iiyama North America Inc., 650 Louis Dr., #120, Warminster, PA 18974; 800-394-4335, 215-



IDEK/Iiyama VisionMaster MF-8617

The VisionMaster's LCD readout works in much the same way as on-screen controls. You toggle through the controls using the menu button, and the display indicates the adjustment in progress as you press the plus and minus buttons located on the front panel.

The TI TravelMate™ family of notebooks offers the perfect workmate to increase your productivity. Because different kinds of people have very different demands, we have created two series—the 4000E and the 4000M—to meet your individual needs.

Every member of the TravelMate family features a powerful 486 processor—up to 75MHz. Combined with monochrome or brilliant color displays, superb battery life, and a variety of configurations, you can be more productive even when you're on the go.

The perfect desktop replacement. The TravelMate E Series.

Looking for the expansion capabilities of a desktop coupled with the portability and convenience of a notebook? Turn to the

TravelMate 4000E Series. Partner the TravelMate 4000E with TI's Intelligent Docking System and you have the ultimate desktop PC replacement. Just insert any of the nine models of TravelMate 4000E notebooks into the Intelligent Docking System, push a button and the auto-load mechanism does the



TravelMate E Series

- ♥ Nine 486 models ranging from a 25MHz up to a racy IntelDX4™/75MHz
- ♥ 4mm full-travel keyboard with a desktop feel, Microsoft BallPoint™ mouse with QuickPort™ connection
- ♥ Desktop Replacement: Intelligent Docking System with 6 ISA and 2 PCMCIA card slots as well as 4 drive bays for additions such as hard drives, CD-ROM, tape drives and more



The TravelMate
notebooks
from Texas
Instruments.
Now there's a
perfect mate for
everyone.



rest. When you're ready to hit the road, simply click an icon and the system saves the files you're working on, closes Windows™ and ejects your TravelMate 4000E. Then you're on your way—that's true desktop replacement.

A new dimension in portable computing. The TravelMate M Series.

If you're looking for a notebook computer that's multimedia-ready, TI brings you the new TravelMate 4000M Series. From the moment you see our TravelMate 4000M, you'll appreciate how much performance it packs into its sleek new design and conveniently located integrated pointing device.

Add the light-weight, battery/AC-powered Portable CD-ROM Docking System and you have an integrated portable multimedia system. Now you can tap into the growing library of information and applications available on CD-ROM. Use the TravelMate 4000M as an incredibly powerful presentation tool, training or auditing system and more—complete with sound and full-motion video capability.

To find out how you can get together with the ideal TravelMate, call **1-800-TI-TEXAS** (1-800-848-3927).



TravelMate M Series

- ♥ Six 486 models ranging from a 25MHz to a racy IntelDX4™/75MHz
- ♥ Built-in PCMCIA slot, integrated pointing device, SCSI II interface, 16-bit sound, internal microphone and speaker, and a 16-bit MIDI port
- ♥ Portable CD-ROM Docking System option with a double-speed CD-ROM drive and built-in stereo speakers

EXTENDING YOUR REACH™

 **TEXAS
INSTRUMENTS**

* Estimated street price, E Series model. Dealer prices may vary. IntelDX4 is a trademark and the Intel Inside logo is a registered trademark of Intel Corp.

TravelMate and "Extending Your Reach" are trademarks of Texas Instruments. Windows, BallPoint and QuickPort are trademarks of Microsoft Corporation. © 1994 TI

CIRCLE 368 ON READER SERVICE CARD

HARDWARE

17-Inch Monitors

SUMMARY OF FEATURES

17-Inch Monitors

Products listed in alphabetical order

■ = YES □ = NO

	AcerView 761	Addonics 172 GLR	ADI MicroScan SEP	Altima V-Scan 80	Amdak AM/6171	Apple Multiple Scan 17 Display	ASTVision 7L	Compaq QVision 172
List price	None quoted	\$899.00	None quoted	None quoted	\$799.00	\$1,099.00	\$915.00	None quoted
Estimated street price	\$849	\$650	\$700	\$900	None quoted	None quoted	\$915	\$1,000
Tube manufacturer	Matsushita	Matsushita	Hitachi	Hitachi	Hitachi	Sony	Hitachi	Sony
Type of tube	Flat-square	Flat-square	Flat-square	Flat-square	Flat-square	Trinitron	Flat-square	Trinitron
Dot pitch or aperture-grill pitch (mm)	0.27	0.28	0.28	0.26	0.26	0.28	0.28	0.26
Antiglare treatment	AGRAS coating	AGRAS coating	Bopped panel	Silica coating	Silica coating	ARAS coating	ARAS coating	ARAS coating
Active screen size (diagonal, in inches)	16.1	16.1	15.5	15.9	16.6	16.0	16.2	15.7
Image can be extended to screen edges	■	■	■	■	■	■	■	■
Dimensions (HWD, in inches)	18.9 x 18.3 x 18.8	17.1 x 16.3 x 16.8	15.8 x 16.1 x 17.5	16.1 x 16.1 x 18	16 x 16.5 x 18.3	16.7 x 15.9 x 17.8	15.5 x 16.4 x 16.8	16.4 x 16.6 x 18.3
Weight	42 lbs. 8 oz.	42 lbs. 10 oz.	40 lbs. 6 oz.	40 lbs. 8 oz.	40 lbs. 8 oz.	50 lbs.	46 lbs. 14 oz.	46 lbs. 2 oz.
Type of adapter:								
Captive to 15-pin/15-pin to 15-pin	□■	□■	□■	□■	□■	□■	□■	■□
BNC-3 to 15-pin/BNC-5 to 15-pin	□□	□□	□□	□■	□■	□□	□■	□□
CCC certification	Class B	Class B	Class B	Class B	Class B	Class B	Class B	Class B
Energy Star-certified/VESA DPMS-compliant	■	■	■	□	■	■	■	■
TCO compliance claimed	□	□	□	■	□	□	□	□
Operational Features								
Vertical scanning frequency (Hz)	50-90	50-90	50-100	50-90	47-105	50-120	50-90	50-110
Horizontal scanning frequency (kHz)	30-64	31-64	30-64	30-64	24-82	30-64	30-64	31.5-62
Maximum noninterlaced resolution	1,280 x 1,024	1,280 x 1,024	1,280 x 1,024	1,600 x 1,280	1,600 x 1,200	1,280 x 1,024	1,280 x 1,024	1,280 x 1,024
Maximum interlaced resolution	1,280 x 1,024	1,024 x 768	1,600 x 1,280	1,600 x 1,280	1,280 x 1,024	N/A	1,280 x 1,024	1,024 x 768
Maximum noninterlaced refresh rates (Hz):								
1,280 x 1,024; 1,024 x 768	60, 72	60, 72	60, 76	72, 80	76, 76	60, 72	60, 75	76, 76
800 x 600; 640 x 480	72, 60	72, 75	90, 100	90, 90	72, 72	75, 75	75, 75	75, 75
Claimed power consumption (watts):								
Maximum, Standby mode	140, 15	130, 15	105, 15	135, N/A	150, N/A	150, 15	126, 95	150, 30
Suspend, Off mode	15, 5	15, 5	16, 4	N/A, N/A	15, N/A	15, 11	6, 6	30, 7
Controls								
Manual controls	Digital	Digital	Analog/digital	Analog/digital	Analog/digital	Digital	Digital	Digital
On-screen menu controls	In on-board ROM	None	None	None	None	Software	None	None
Changes in manual controls automatically reflected in on-screen controls and vice versa	m	N/A	N/A	N/A	N/A	m	N/A	N/A
Manual degaussing/Degaussing on power-up	■	■	■	■	■	□	■	■
Color matching/Pincushioning	■	□	■	■	■	■	□	■
Trapezoidal adjustment/Orthogonality	■	■	■	□	□	□	□	■
Tilt or rotation/Convergence	□	□	■	□	■	■	□	■
Customer Service								
Technical support number	800-445-6495	408-943-0108	800-228-0530	510-358-9008	800-800-9873	800-767-2775	800-676-4278	800-682-6672
Technical support hours (eastern time)	24 hours, 7 days	11:30-8:30 M-F	11:30-8:30 M-F	10:00-7:00 M-F	10:00-8:00 M-F	9:00-8:00 M-F	24 hours, 7 days	24 hours, 7 days
888	■	■	■	■	■	□	■	■
Warranty	1 year	2 years	2 years	2 years	1 year	1 year	1 year	1 year

N/A—Not applicable. The product does not have this feature.

957-6543; fax, 215-957-6551.

Circle 499 on reader service card

Ikegami Electronics Inc.

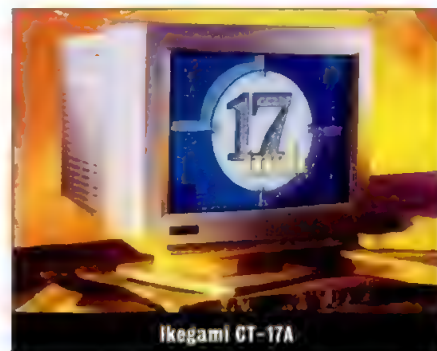
• Ikegami CT-17A

BY KATIE BARNES

If graphics is your business and price is no object, the Ikegami CT-17A may be the monitor for you. Targeted primarily at the Macintosh market, the Ikegami is nonetheless suited for high-end PC video

editing and prepress graphics work. But this unbeaten image quality commands a high price: \$1,200 street (\$1,990 list).

With the highest Average MTF and the best vertical pincushioning scores in this roundup, the Ikegami showed outstanding sharpness and clarity. We observed no muddiness between characters. The refresh rate is a comfortable 76 Hz up to 1,240-by-1,068. Our unit's color accuracy was below average, but colors were bright and well saturated.



CONTINUES

CTX 1765GM	CTX 1785GM	ETC ViewMagic CA-1765SPL	Goldstar Model 1725	Hyundai HL-7682A	IBM 17P
\$999.00	\$1,049.00	\$699.00	\$899.00	\$1,439.00	\$1,199.00
\$749	\$849	\$650	\$849	\$899	None quoted
Matsushita	Hitachi	Hitachi	Hitachi	Hitachi	Sony
Flat-square	Flat-square	Flat-square	Flat-square	Flat-square	Trinitron
0.27	0.26	0.26	0.28	0.26	0.26
AGRAS coating	AGRAS coating	Etch treatment	Etch treatment	Etch treatment	Silica coating
16.0	16.0	16.1	16.0	16.0	15.4
■	■	■	■	■	■
17 x 16.5 x 18.5	17.1 x 16.5 x 18.6	15.7 x 16.5 x 17.4	17.1 x 16.5 x 18.5	16.5 x 18 x 20	17.1 x 16.1 x 18.3
46 lbs. 5 oz.	47 lbs. 2 oz.	40 lbs. 3 oz.	44 lbs. 10 oz.	47 lbs.	49 lbs. 14 oz.
■ □	□ ■	□ ■	□ ■	□ ■	□ ■
□ □	□ ■	□ □	□ □	□ ■	□ ■
Class B	Class B	Class B	Class B	Class A	Class B
■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
□	□	□	□	□	■ (European model only)
50-100	50-100	50-120	50-120	45-100	50-110
30-65	30-85	30-65	30-65	30-82	30-82
1,280 x 1,024	1,600 x 1,280	1,280 x 1,024	1,280 x 1,024	1,280 x 1,024	1,360 x 1,024
1,280 x 1,024	1,600 x 1,280	1,280 x 1,024	1,280 x 1,024	1,024 x 768	1,600 x 1,280
60, 75	75, 75	60, 72	60, 76	70, 70	77, 100
75, 75	75, 75	72, 75	72, 72	72, 67	110, 110
130, 75	130, 75	85, 17	100, 15	130, 8	110, 80
9, 5	9, 5	17, 18	15, 8	8, 5	30, 8
Analog/digital	Analog/digital	Digital	Analog/digital	Digital	Digital
None	None	In on-board ROM	None	None	None
N/A	N/A	M	N/A	N/A	N/A
■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
■ ■	■ ■	■ ■	□ ■	■ ■	■ ■
■ □	■ □	■ □	■ □	■ □	■ □
■ □	■ □	■ □	□ □	■ □	□ ■
800-888-2012	800-888-2012	510-228-6250	800-222-6457	800-289-4986	800-426-7378
11:30-8:00 M-F	11:30-8:00 M-F	11:30-8:30 M-F	9:00-6:00 M-F	11:00-8:00 M-F	24 hours, 7 days
■	■	□	□	□	□
2 years	2 years	2 years	2 years	2 years	3 years

The Ikegami comes bundled with on-screen control software for the Mac, but not for Microsoft Windows. The front panel offers the usual digital contrast, brightness, and positioning controls, plus pincushioning and color matching. All the usual PC monitor timings are available, but the default presets are oriented toward Mac timings; PC users may find themselves adjusting a lot of controls at first. The Ikegami lacks any power-saving features.

► **Ikegami CT-17A.** List price: \$1,990.

Ikegami Electronics Inc., 37 Brook Ave., Maywood, NJ 07607; 800-368-9171, 201-368-9171; fax, 201-569-1626.

Circle 500 on reader service card

MAG InnoVision Inc.

• **MAG DX17F**

• **MAG MXP17F**

BY BRIAN FIKES

The low-priced MAG DX17F (\$799 list) is an acceptable choice for the budget-

mindful, general-purpose user. The higher-priced MAG MXP17F (\$1,299 list, \$1,055 street) seems targeted at graphics and DTP professionals, but better-performing 17-inch monitors are available at lower prices.

The MAG DX17F offers a relatively high 76-Hz refresh rate at 1,024-by-768, and its pincushioning scores were the second best in our review. Its Average MTF score of 36.5 percent was near our minimum acceptable score of 35.0 percent, but we found sharpness acceptable in our subjective evaluation. Maximum Usable Brightness and RMS Misconvergence scores were also below average but acceptable for this price. Mainstream business users looking for a bargain should be satisfied with this unit, which comes with a mix of basic analog and digital controls, including brightness, contrast, sizing, positioning, and pincushioning and tilt adjustment. No on-screen controls are offered.

For its higher price, the MAG MXP17F offers higher refresh rates of 85 Hz at 1,024-by-768 and 76 Hz at 1,280-by-1,024; it also has a better antiglare coating than the MAG DX17F. It adds trapezoidal and color adjustments and is one of the few monitors to offer BNC, 15-pin, and 15-pin mini-jacks. The BNC/DSUB switch allows you to connect two computers and switch between them. Another nice touch is the front-panel LCD readout, which displays such useful information as scanning frequency and resolution. On-screen controls should be added by the time you read this, though the software was not available at review time.

Unfortunately, the MAG MXP17F's mediocre performance may leave high-end customers wanting. It showed better-than-average pincushioning results and good color accuracy, but the Maximum Usable Brightness and RMS Misconvergence scores (albeit better than those of the MAG DX17F and still acceptable) were in the bottom third for monitors reviewed here. In our subjective tests, we found focus merely acceptable; convergence problems were clearly visible at the corners. If you're looking for a 17-inch monitor for graphics or desktop publishing, you may want to look elsewhere.

► **MAG DX17F.** List price: \$799. **MAG MXP17F.** List price: \$1,299. MAG InnoVision Inc., 2801 S. Yale St., Santa Ana,

Sony With Soul



ADI.

ADI delivers the reliability and quality of Sony, without the brand name price.

You want a top-of-the-line monitor. And you're looking at Sony MultiScans. But you have bottom line concerns, and you'd like to look at a cost-efficient alternative in the same league as Sony. Look at ADI MicroScan™. With microprocessor intelligence. 18-mode memory. Front panel digital controls. 76 Hz non-interlaced scanning for stunning, flicker-free images. Razor sharp resolution of up to 1280 x 1024. Special anti-glare, dark glass CRT surfaces. And performance that meets

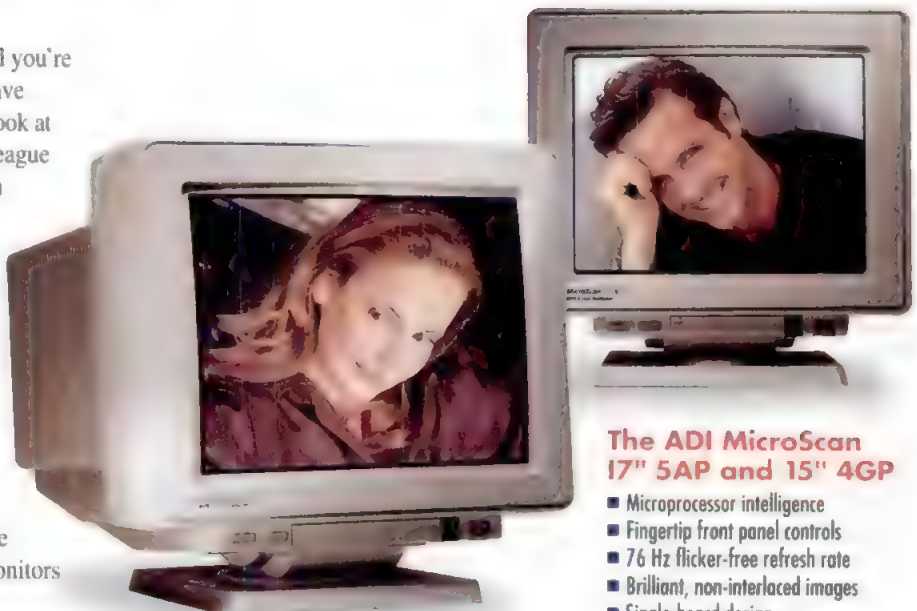
or exceeds every standard for manufacturing, power conservation, ergonomics and safety. That's why three million ADI MicroScan monitors have been sold.



March 16, 1993
ADI MicroScan 3E+

Then to sum up the differences, between Sony and ADI, look at the price tags. With ADI, the sum you save will let you go out and buy a top quality TV set for your living room. Say a Sony.

For information on ADI, our monitors and our company, call (800) 228-0530 today. For faxed product information and editorial reviews, call (800) 767-8182



The ADI MicroScan 17" 5AP and 15" 4GP

- Microprocessor intelligence
- Fingertip front panel controls
- 76 Hz flicker-free refresh rate
- Brilliant, non-interlaced images
- Single-board design
- 2-year warranty

ADI

Any way you look at it.



ADI Systems, Inc. 2115 Ringwood Avenue, San Jose, CA 95131

MicroScan is a trademark of ADI Systems Inc. All other brands or product names are trademarks or registered trademarks of their respective companies.
© 1994 ADI Systems Inc. All rights reserved

CIRCLE 226 ON READER SERVICE CARD

SUMMARY OF FEATURES

17-Inch Monitors

Products listed in alphabetical order

■ = YES □ = NO

	IDEK/iyama VisionMaster MF-8617	Ikegami CT-17A	MAG MXP17F	MAG DX17F	MITAC Performance Series L1762	Mitsubishi Diamond Scan 17FS	Nemco FlexScan F5501W	Nemco FlexScan F5801W
List price	\$799.00	\$1,990.00	\$1,299.00	\$799.00	\$999.00	\$1,069.00	\$1,099.00	\$1,399.00
Estimated street price	\$799	\$1,200	\$1,055	None quoted	\$749	\$945	\$970	\$1,230
Tube manufacturer	Hitachi	Sony	Toshiba	Hitachi	Hitachi	Mitsubishi	Mitsubishi	Mitsubishi
Type of tube	Flat-square	Trinitron	Flat-square	Flat-square	Flat-square	Flat-square	Flat-square	Flat-square
Dot pitch or aperture-grill pitch (mm)	0.26	0.26	0.26	0.26	0.26	0.28	0.28	0.26
Antiglare treatment	Bonded panel	Bonded panel	AGRAS coating	Etch treatment	ARAG coating	ARAS coating	ARAS coating	ARAS coating
Active screen size (diagonal, in inches)	15.8	15.9	16.0	16.0	15.8	15.7	15.6	15.8
Image can be extended to screen edges	■	■	■	□	■	■	■	■
Dimensions (HWD, in inches)	16.8 x 16.4 x 18	16.5 x 16.4 x 18.3	16.8 x 17.3 x 18.8	16.5 x 16.1 x 17.3	17 x 16.6 x 17.3	15.8 x 16.3 x 17.2	16.4 x 16.1 x 17.5	16.4 x 16.1 x 17.5
Weight	47 lbs. 10 oz.	61 lbs. 14 oz.	52 lbs. 2 oz.	41 lbs. 14 oz.	43 lbs. 5 oz.	37 lbs. 14 oz.	49 lbs. 6 oz.	50 lbs. 6 oz.
Type of adapter								
Captive to 15-pin/15-pin to 15-pin	□■	□■	■□	□■	□■	□■	□■	□■
BNC-3 to 15-pin/BNC-5 to 15-pin	■□	□■	■□	□□	□□	□□	□■	□■
FCC certification	Class B	Class A	Class B	Class B	Class B	Class B	Class B	Class B
Energy Star-certified/VESA DPMS-compliant	■□	□□	■□	■□	□□	■□	■□	■□
TCO compliance claimed	□	□	Optional (\$99)	□	□	□	□	□
Operational Features								
Vertical scanning frequency (Hz)	50-120	50-150	50-120	50-100	47-120	50-130	55-90	55-90
Horizontal scanning frequency (kHz)	24-86	30-81	30-82	30-64	29-82	30-78	27-65	30-82
Maximum noninterlaced resolution	1,600 x 1,280	1,600 x 1,280	1,600 x 1,280	1,280 x 1,024	1,600 x 1,280	1,280 x 1,024	1,280 x 1,024	1,280 x 1,024
Maximum interlaced resolution	N/A	N/A	1,600 x 1,280	1,280 x 1,024	1,600 x 1,280	1,280 x 1,024	1,280 x 1,024	1,280 x 1,024
Claimed maximum noninterlaced refresh rates (Hz)								
1,280 x 1,024; 1,024 x 768	80, 80	76, 76	76, 85	60, 76	60, 76	74, 74	60, 80	76, 90
800 x 600; 640 x 480	80, 80	76, 76	120, 120	85, 100	76, 76	76, 76	90, 90	90, 90
Claimed power consumption (watts):								
Maximum, Standby mode	130, 15	135, N/A	130, 30	120, 20	N/A, N/A	120, 96	120, 10-12	120, 10-12
Suspend, Off mode	8, 6	N/A, N/A	30, 10	20, 10	N/A, N/A	30, 5	8-10, 2-4	8-10, 2-4
Controls								
Manual controls	Digital	Digital	Analog/digital	Analog/digital	Analog/digital	Digital	Digital	Digital
On-screen menu controls	None (displayed on LCD panel instead)	None	None (displayed on LCD panel instead)	None	In on-board ROM	Optional software (\$19.95)	None	None
Changes in manual controls automatically reflected in on-screen controls and vice versa	N/A	N/A	N/A	N/A	■	■ (with software)	N/A	N/A
Manual degaussing/Degaussing on power-up	■□	■□	■□	■□	■□	■□	■□	■□
Color matching/Pincushioning	■□	■□	■□	□■	■□	■□	■□	■□
Trapezoidal adjustment/Orthogonality	■□	□□	■□	□□	■□	■□	■□	■□
Tilt or rotation/Convergence	■□	□■	■□	■□	□□	□□	□■	□□
Customer Service								
Technical support number	800-394-4335	201-368-9171	800-827-3998	800-827-3998	800-756-2888	800-344-6352	800-800-5202	800-800-5202
Technical support hours (eastern time)	8:30-5:00 M-F	9:00-5:00 M-F	11:00-8:00 M-F	11:00-8:00 M-F	9:30-8:30 M-F	11:30-3:00, 4:00-7:00 M-F	11:30-8:00 M-F	11:30-8:00 M-F
BBS	□	□	□	□	□	□	■	■
Warranty	3 years	2 years	1 year; 2 years CRT	1 year; 2 years CRT	3 years	3 years	3 years	3 years; 1 year CRT

N/A—Not applicable. The product does not have this feature.



The MAG MXP17F offers a mix of analog and digital controls. The LCD readout on the front panel displays resolution, refresh rate, and whether the display is interlaced or noninterlaced. A BNC/DSUB switch lets you connect two computers and switch between them.

HARDWARE

17-Inch Monitors

CONTINUES



NEC MultiSync 5FGe	NEC MultiSync 5FGp	Nissel Sangyo/ Hitachi SuperScan Elite 17	Nokia Multigraph 447X	Optquest 400TC	Orchestra MultiSystems The Tube
\$1,045.00	\$1,175.00	None quoted	\$1,199.00	\$1,389.00	\$899.00
\$995	\$1,100	\$1,049	\$1,075	\$849	\$689
NEC	NEC	Hitachi	Sony	Sony	Hitachi
Flat-square	Flat-square	Flat-square	Trinitron	Trinitron	Flat-square
0.29	0.28	0.26	0.26	0.25	0.26
Optional OCU panel (\$100)	Proprietary OptiClear surface	ARAS coating	Silica coating	ARAS coating	Etch treatment
15.6	15.5	15.9	15.4	15.8	15.8
■	■	■	■	■	■
17.8 x 16.4 x 19.8	17.8 x 16.4 x 19.8	18.9 x 16 x 18.3	16.4 x 16.8 x 18.1	16.3 x 16.1 x 19.1	16.9 x 16.2 x 17.5
53 lbs. 5 oz.	56 lbs. 6 oz.	47 lbs. 11 oz.	45 lbs. 13 oz.	52 lbs. 13 oz.	43 lbs. 2 oz.
■ □	■ ■	□ ■	□ ■	■ □	■ ■
□ □	■ ■	□ ■	■ ■	□ □	■ ■
Class B	Class A	Class B	Class B	Class B	Class B
□ ■	■ ■	■ ■	■ ■	■ ■	□ □
□	□	□	Optional (\$199)	□	□
55-90	55-90	55-120	50-110	50-90	50-90
31-82	27-79	30-82	30-82	24-84	31-82
1,024 x 768	1,280 x 1,024	1,600 x 1,200	1,600 x 1,280	1,280 x 1,024	1,600 x 1,280
1,024 x 768	1,280 x 1,024	1,600 x 1,200	N/A	1,600 x 1,280	1,280 x 1,024
N/A, 76	74, 76	77, 102	76, 95	80, 76	74, 76
76, 76	76, 76	120, 120	110, 110	90, 90	72, 72
100, 93	155, 144	125, 25	120, 8	150, 25	N/A, N/A
20, 20	31, 31	26, 8	N/A, 8	25, 5	N/A, N/A
Digital	Analog/digital	Digital	None	Analog/digital	Digital
None	None	Software	In on-board ROM	None	None
N/A	N/A	■	□	N/A	N/A
■ ■	■ ■	■ □	■ ■	■ ■	■ ■
□ ■	■ ■	■ ■	■ ■	■ ■	□ □
□ □	□ □	■ □	■ ■	□ □	□ □
■ □	■ □	□ □	■ ■	□ □	□ □
800-388-8888	800-388-8888	817-461-8300	800-483-7952	800-943-6784	800-237-9988
8:30-8:30 M-F	8:30-8:30 M-F	9:00-5:00 M-F	8:00-7:00 M-F	11:00-8:00 M-F	10:00-9:00 M-F
■	■	□	□	□	□
3 years; 1 year CRT	3 years	3 years	3 years	2 years parts, 1 year labor	3 years



accuracy was satisfactory, but colors were not well saturated, and the MiTAC often had trouble syncing correctly when switching between DOS and Windows.

On-screen controls were easy to use and include pincushioning, color matching, and trapezoidal adjustment. The control window covers a significant portion of the screen, so it was difficult to optimize the entire picture. A MiTAC representative told us the Performance Series L1782 would be Energy Star-compliant by the time you read this.

Other than a three-year warranty, little about the MiTAC stands out.

► **MiTAC Performance Series L1782.** List price: \$999. Other 17-inch model: MiTAC Advantage Series A1775, \$899. MiTAC, 3797 Spinnaker Ct., Fremont, CA 94538; 510-440-3654; fax, 510-440-3604.

Circle 502 on reader service card

Mitsubishi Electronics America Inc.

• Diamond Scan 17FS

BY KATIE BARNES

The Diamond Scan 17FS's \$945 street price (\$1,069 list) seems a little high considering our test unit's average overall performance. Mitsubishi, however, does have a bonus for corporate users that buy



CA 92704; 800-827-3998, 714-751-2008; fax, 714-751-5522.

Circle 501 on reader service card

MiTAC

• MiTAC Performance Series L1782

BY KATIE BARNES

The MiTAC Performance Series L1782 was a satisfactory performer on most of our tests, but its Average MTF score of

37.5 percent was very low (our minimum acceptable score was 35.0 percent), and focus was unacceptably poor in subjective testing. Even with its respectable 76-Hz refresh rate at 1,024-by-768 resolution and its \$749 street price (\$999 list), the MiTAC is not much of a value.

The MiTAC's low MTF results were confirmed by the blurred, muddy appearance of displayed text. The antiglare treatment was effective but at least partially responsible for the unit's poor focus. Color

45 minutes ago you were

drawing flowcharts, e

charts, e

pla

“Geez, I d

could do all tha

You just sip your coffee.

Forget the colored tights. The flowing cape. And the chrome underwear. You don't need them to be a superhero. All you need is Windows.[®] An hour. And Visio[™] software. It's graphics software that gives you the power to do things you never dreamed of doing. Like drawing a flowchart and putting it into a memo. The big word here is ENABLING. With Visio, you can effortlessly drop graphics into your business documents. No other business graphics program lets you do so much, so fast, with such superhuman efficiency. With 22 stencils and over 750 pre-drawn SmartShapes,[™] you can draw all

All trademarks referenced herein are held by Shapewars Corp., except for Windows which is a trademark of Microsoft Corp. © 1994 Shapewars Corporation. All rights reserved.

kinds of stuff. (Without actually drawing a darn thing.) Block diagrams. Project timelines. Engineering schematics. You name it.

be a *more mortal*. Now you're

flowcharts, organizational

even space

ns, and someone says,

didn't know *You*

t." And

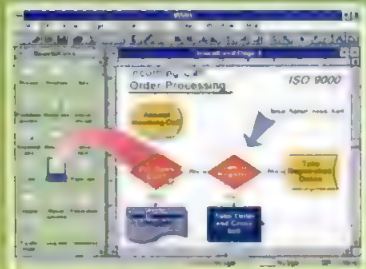
Visio and your Windows applications. The perfect marriage. How so? Visio has leading edge support for the OLE 2.0 standard. Which means, you can integrate terrific visuals into all of your documents. It's a beautiful thing.

Your coworkers will be amazed. Your clients will be wowed. Your boss will be impressed. Look, up in the sky. It's a bird. It's a plane. Hey, who in the heck is that guy?

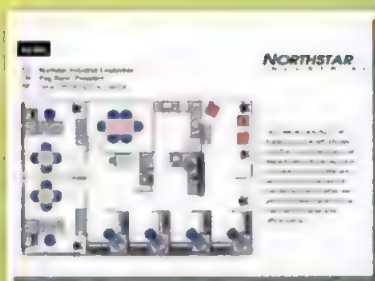
Order today. Call (800) 457-3335, ext. A24 and get Visio for a mere \$129. There's no better way to try Visio than to load it up and take it for a spin. Our 60-day money-back offer guarantees you'll love it.



So you're no Rembrandt. No problem. Using Visio is a piece of cake. Just drag the pre-drawn SmartShapes from your stencil to your drawing page, then, simply drop them in. (In technical terms: Drag, Drop, Done.)



Visio is packed with 22 stencils and well over 750 SmartShapes. So what does this mean for you? Well, it means you can draw space plans. You can draw Total Quality Management (TQM) diagrams. You can draw maps. You can draw and draw and draw till it hurts.



Business drawing for people whose business isn't drawing.

► SUMMARY OF FEATURES

17-Inch Monitors

PC MAGAZINE
EDITORS' CHOICE

Products listed in alphabetical order

■ = YES □ = NO

	Packard Bell PB6517SVGM	Panasonic PanaSync C1791E	Philips Brilliance 1720	Radios PrecisionColor Display/17	Samsung SyncMaster 17GL	Samsung SyncMaster 17GLs	Sceptre CL-617GL+	SDIS ErgoView 170
List price	None quoted	\$999.00	\$1,399.00	\$1,299.00	\$999.00	\$1,199.00	\$895.00	\$1,599.00
Estimated street price	\$650	\$799	\$1,170	\$1,050	\$859	\$995	\$699	\$1,075
Tube manufacturer	Mitsubishi	Mitsubishi	Matsushita	Sony	Hitachi	Hitachi	Hitachi	Matsushita
Type of tube	Flat-square	Flat-square	Flat-square	Trinitron	Flat-square	Flat-square	Flat-square	Flat-square
Dot pitch or aperture-grill pitch (mm)	0.28	0.28	0.27	0.26	0.28	0.26	0.26	0.27
Antiglare treatment	AGRAS coating	AGRAS coating	AGRAS coating	Silica coating	Etch treatment	ARAS coating	Silica coating	AGRAS coating
Active screen size (diagonal, in inches)	15.8	15.8	16.1	15.9	15.6	15.6	15.9	16.4
Image can be extended to screen edges	■	■	■	■	■	■	■	■
Dimensions (HWD, in inches)	16.3 x 16.1 x 17.3	16.3 x 16.1 x 17.3	16.4 x 16.4 x 17.3	16.1 x 16 x 17.8	17 x 16.6 x 17	17 x 16.6 x 17	15.4 x 16.2 x 17.4	16.5 x 16.6 x 17.4
Weight	37 lbs. 8 oz.	37 lbs. 3 oz.	44 lbs. 3 oz.	48 lbs. 3 oz.	46 lbs. 10 oz.	46 lbs. 14 oz.	41 lbs. 3 oz.	44 lbs. 8 oz.
Type of adapter:								
Captive to 15-pin/15-pin to 15-pin	□ ■	□ ■	□ ■	□ □	□ ■	□ ■	■ □	□ ■
BNC-3 to 15-pin/BNC-5 to 15-pin	□ □	□ □	□ ■	□ ■	□ □	□ ■	□ □	□ ■
FCC certification	Class B	Class B	Class B	Class B	Class B	Class B	Class B	Class B
Energy Star-certified/VESA DPMS-compliant	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	□ □
TCO compliance claimed	□	□	□	□	□	□	Optional (\$30)	□
Operational Features								
Vertical scanning frequency (Hz)	50-160	50-160	50-120	50-150	50-100	50-120	50-90	50-120
Horizontal scanning frequency (kHz)	30-64	30-64	30-82	29-82	30-65	30-82	30-68	30-82
Maximum noninterlaced resolution	1,280 x 1,024	1,280 x 1,024	1,600 x 1,280	1,600 x 1,280	1,280 x 1,024	1,280 x 1,024	1,280 x 1,024	1,600 x 1,280
Maximum interlaced resolution	1,280 x 1,024	1,280 x 1,024	1,600 x 1,280	1,600 x 1,280	1,024 x 768	1,024 x 768	N/A	N/A
Maximum noninterlaced refresh rates (Hz):								
1,280 x 1,024; 1,024 x 768	60, 72	60, 72	76, 100	75, 75	60, 76	76, 76	60, 75	76, 100
800 x 600; 640 x 480	75, 75	72, 72	100, 100	72, 75	76, 76	76, 76	75, 75	120, 120
Claimed power consumption (watts):								
Maximum, Standby mode	130, 75	130, 30	110, 10	140, 15	83, 54	86, 57	110, 100	125, N/A
Suspend, Off mode	15, 8	30, 8	10, 5	15, 10	22, 8	20, 7	15, 5	N/A, N/A
Controls								
Manual controls	Digital	Digital	Analog/digital	Digital	Analog/digital	Analog/digital	Analog/digital	Analog/digital
On-screen menu controls	In on-board ROM	In on-board ROM	None	None	None	In on-board ROM	None	None
Changes in manual controls automatically reflected in on-screen controls and vice versa	□	□	N/A	N/A	N/A	■	N/A	N/A
Manual degaussing/Degaussing on power-up	■ □	■ ■	■ ■	□ ■	■ ■	■ ■	■ ■	■ ■
Color matching/Pincushioning	■ ■	■ ■	□ ■	■ ■	□ ■	■ ■	□ ■	□ ■
Trapezoidal adjustment/Orthogonality	■ ■	■ ■	■ □	□ □	■ □	■ □	□ □	■ ■
Tilt or rotation/Convergence	□ □	□ □	□ □	■ ■	□ □	□ ■	□ □	■ □
Customer Service								
Technical support number	800-733-4411	800-726-2797	800-835-3506	408-434-1012	800-726-7864	800-726-7864	800-788-2878	510-770-2900
Technical support hours (eastern time)	24 hours, 7 days	9:00-5:00 M-F	8:00 A.M.-9:00 P.M. M-F	9:00-9:00 M-F	9:00-6:00 M-F	9:00-6:00 M-F	8:30-5:30 M-F	10:00-8:00 M-F
BBS	■	■	□	■	■	■	■	■
Warranty	1 year	1 year	3 years	1 year	2 years	2 years	3 years	1 year

N/A—Not applicable: The product does not have this feature

at least 50 Mitsubishi monitors in a three-month period; a three-year warranty program with guaranteed replacement of any defective unit within 48 hours.

Though still inside our acceptable range, the Diamond Scan's Average MTF score was in the bottom quarter for monitors reviewed here, a poor showing that was confirmed by muddy and ill-focused text. We also observed moiré patterns. But those more interested in graphics than text should note that the Diamond Scan had the

best color accuracy and yielded better-than-average misconvergence scores.

The Diamond Scan comes with plentiful front-panel controls, including pincushioning, color matching, and trapezoidal adjustment, but we found ourselves continually flipping through the user manual to keep track of what we were doing. You can purchase Diamond Control for Windows software for an extra \$19.95. This package provides on-screen slider controls and test patterns to help

you correct distortions and adjust an image's size, positioning, and color temperature. The software also lets you use the unit's power-saving features without an Energy Star-compliant PC.

► **Diamond Scan 17FS.** List price: \$1,069. Other 17-inch model: Diamond Pro 17, \$1,199. Mitsubishi Electronics America Inc., 5665 Plaza Dr., Cypress, CA 90630; 800-843-2515, 714-236-6352; fax, 714-236-6172.

Circle 503 on reader service card

HARDWARE

17-Inch Monitors

ENDS

Sony MultiScan 17se	SuperMac SuperMatch 17 XL	Tatung OmniScan CM17MKR	ViewSonic 17	ViewSonic 17G	Wen JK1775 Digital Control Color Monitor
\$1,249.95	\$1,049.00	\$995.00	\$1,045.00	\$945.00	\$999.00
None quoted	\$825	\$850	\$945	\$872	\$890
Sony	Matsushita	Hitachi	Matsushita	Mitsubishi	Hitachi
Trinitron	Flat-square	Flat-square	Flat-square	Flat-square	Flat-square
0.26	0.28	0.28	0.27	0.28	0.26
Silica coating	AGRAS coating	ARAG coating	ARAG coating	ARAG coating	ARAS coating
16.0	16.1	15.9	15.8	15.8	15.9
■	■	■	■	■	■
16.1 x 16 x 17.9	16.5 x 16.3 x 16.8	16.9 x 16.3 x 19	16.6 x 16.1 x 17.1	16.6 x 16.1 x 17.3	16.1 x 15.9 x 17.5
48 lbs. 11 oz.	42 lbs. 5 oz.	49 lbs. 6 oz.	39 lbs. 10 oz.	31 lbs. 10 oz.	51 lbs.
□□	□□	□■	□■	□■	□■
□■	□□	□ Optional	□■	□□	□ Optional
Class B	Class B	Class A	Class B	Class B	Class B
■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
□	□	□	□	□	□
50-150	50-90	50-120	50-160	50-160	50-90
32-82	31-64	30-82	30-82	30-64	30-81
1,600 x 1,280	1,280 x 1,024	1,600 x 1,280	1,600 x 1,280	1,280 x 1,024	1,280 x 1,024
N/A	N/A	1,600 x 1,280	1,600 x 1,280	1,280 x 1,024	N/A
77, 100	60, 75	75, 75	76, 100	60, 76	72, 75
100, 100	75, 84	75, 75	120, 150	90, 115	75, 75
140, N/A	125, 9	130, 104	140, 112	130, 104	130, 30
14, 10	9, 2	5, 5	30, 8	30, 8	15, 2
Digital	Digital	Analog/digital	Digital	Analog/digital	Analog/digital
None	None	None	In on-board ROM	In on-board ROM	None
N/A	N/A	N/A	■	■	N/A
□■	■ ■	■ ■	■ ■	■ ■	■ ■
■ ■	□■	□■	■ ■	■ ■	□□
□□	■□	□□	■□	■□	□□
■ ■	□□	□□	■□	□□	□□
408-894-0225	800-541-7680	310-637-2105	800-888-8583	800-888-8583	914-347-7515
11:00-8:00 M-F	8:00-5:00 MWF, 6:00-4:00 Th	10:30-8:30 M-F	10:00-9:00 M-F	10:00-9:00 M-F	10:00-5:00 M-F
■	■	■	■	■	□
1 year; 2 years CRT	1 year	2 years	3 years parts, 1 year labor	2 years parts, 1 year labor	1 year

Nanao USA Corp.

• **Nanao FlexScan F550iW**

• **Nanao FlexScan F560iW**

BY BRIAN FIKES

Nanao USA Corp. was the first monitor vendor to join the Energy Star program and one of the first to feature MPR II compliance. Now, Nanao is the first to bundle Colorific Color Management software with its monitors. Colorific uses

Kodak's precision color-matching system to match Microsoft Windows screen colors to color-printer output. Of course, Nanao monitors aren't cheap. The \$1,099 FlexScan F550iW (\$970 street) and the \$1,399 FlexScan F560iW (\$1,230 street) we reviewed are aimed squarely at graphics and DTP professionals, with the features, performance, and control that audience demands.

Both FlexScans have excellent refresh rates; at 1,024-by-768, the F550iW can run

at 80 Hz, and the F560iW at 90 Hz. The F560iW has a smaller dot pitch: 0.26 mm versus 0.28 mm for the F550iW.

Both units had excellent picture quality, with the higher-priced FlexScan F560iW outscoring its stablemate. We did find, however, that our test units were neither as well focused nor as bright on the edges of the screen as in the center. Both had excellent color accuracy, but maximum usable brightness, though acceptable, was below average.

These monitors really shine when it comes to features. Their controls are ele-

*The FlexScans' version
of After Dark lets you set
the length of screen-
saver display time
before the unit goes into
power-saving mode.*

gant and precise and include pincushioning, color matching, and trapezoidal adjustment. Digital settings are controlled with a single rotary knob, but there are no on-screen controls.

The FlexScans are compatible with both DPMS and screen-blanking. They also come with a special version of After Dark screen-saving software that lets you set the length of time the screen saver is displayed before the unit goes into power-saving mode. The high quality of these monitors shows up in other features as well, such as an OCLI (Optical Coating Laboratories Inc.) antiglare treatment, excellent manuals, and a three-year warranty (one year on the CRT).

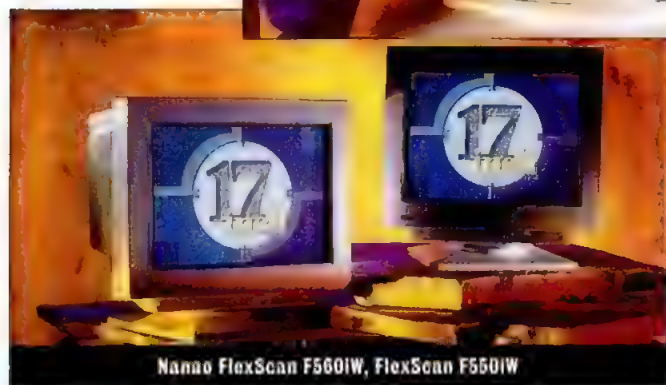
For multimedia and CAD/CAM use, Nanao offers its new FlexScan T2-17 (list price, \$1,299). This Trinitron-equipped monitor comes with moiré reduction, tilt adjustment, and has an improved antiglare/antistatic coating. It also offers higher scanning frequencies and resolutions (1,024-by-768 at 100 Hz, 1,280-by-1,024 at 80 Hz, and even 1,600-by-1,200 at 66 Hz).

The FlexScan F550iW or F560iW should serve the high-end user well.

17-Inch Monitors

► **Nanao FlexScan F550iW.** List price: \$1,099. **Nanao FlexScan F560iW.** List price: \$1,399. Other 17-inch models: FlexScan F550i, \$950; FlexScan T560i, \$1,525; FlexScan T2-17, \$1,299. Nanao USA Corp., 23535 Telo Ave., Tor-

rance, CA 90505; 800-800-5202, 310-325-5202; fax, 310-530-1679.



Nanao FlexScan F560iW, FlexScan F550iW

Circle 504 on reader service card

Circle 504 on reader service card

NEC Technologies Inc.

• NEC MultiSync 5FGc • NEC MultiSync 5FGp

BY BRIAN FIKES

NEC monitors have become a standard for picture quality and features, and other vendors have worked hard to measure up—with some success. So while you won't be at all disappointed with either the MultiSync 5FGc or MultiSync 5FGp, you may find slightly better performance at a lower price. Last year we gave an Editors' Choice to the MultiSync 5FG, which has been replaced by the 5FGp.

The MultiSync 5FGc (\$1,045 list, \$985 street) is targeted at the mainstream business user. It's the only monitor in this roundup without antiglare treatment and

back: The refresh rate is a comfortable 76 Hz, and NEC offers an optional \$100 OCLI panel to reduce glare. (Get the light-gray version; the darker one is recommended for CAD/CAM users only.)

While its MTF scores were below average, the MultiSync 5FGc delivers an acceptably sharp picture with excellent brightness and good color quality. Our only complaints are that the image is less bright and the focus fuzzier at the edges of the screen than at the center. The digital controls include pincushioning and tilt adjustments and are intuitive to use.

The \$1,175 MultiSync 5FGp (\$1,100 street) aims at the more sophisticated graphics and CAD/CAM user, offering antiglare treatment and 1,280-by-1,024 resolution at 74 Hz. It also adds BNC, 15-pin, and 15-pin mini-jack inputs and color control.

The MultiSync 5FGp suffers from the same spatial uniformity problems as the

We were impressed with the front-panel controls of the two Nanao monitors. You control digital settings with a rotary knob, which makes adjustments very precise—neither too coarse nor too slow.

5FGc and exhibits more pincushioning error, but it delivers better color accuracy and a sharper picture. Its Average MTF score was the highest of any monitor reviewed here.

Measuring almost 18 inches high and 20 inches deep, both MultiSyncs are

among the bulkiest in this roundup. They are also among the few that have a clean back panel (the serial-number plate is tucked away on the underside), an aesthetic plus. Both monitors come with an admirable three-year warranty and a power-saving mode that works with VESA DPMS-compliant PCs. The MultiSync 5FGp, however, couldn't make it under the 30-watt Energy Star requirement, and the 5FGc just barely came in under 30 watts on our tests.

NEC is revising its MultiSync line and by early fall will offer 15- to 21-inch monitors that address both business and high-end users.

► **NEC MultiSync 5FGc.** List price: \$1,045. **NEC MultiSync 5FGp.** List price: \$1,175. NEC Technologies Inc., 1255 Michael Dr., Wood Dale, IL 60191; 800-388-8888, 708-860-9500; fax, 708-860-7973.

Circle 505 on reader service card

Nissei Sangyo America/Hitachi

• SuperScan Elite 17

BY KATIE BARNES

With a street price of \$1,049, Nissei Sangyo America/Hitachi's SuperScan Elite 17 should offer something special. What you get is some excellent features but only average performance. The Elite had average or below-average scores on



Nissei Sangyo/Hitachi SuperScan Elite 17

all our tests except one; its MTF score, which was in the top 25 percent of the monitors in this roundup.

Subjectively, the Elite has more than a few strengths. It is particularly adept at mode switching between Microsoft Windows and DOS. Where many other monitors show bouncing and syncing problems, the Elite is rock-solid and quick to adjust. It has good color tonality and comes bundled with a serial cable and a



NEC MultiSync 5FGc, NEC MultiSync 5FGp

We're Becoming Very Big In Monitors.



Imagine this: Once every 15 seconds someone in the USA buys a new CTX color monitor.

That's a million last year alone – more even than sold under big names like NEC, Sony, IBM and Mitsubishi*.

And that's before the international experts started raving about our bigger, new, high-performance 1765GM and 1785GM 17-inch "green" monitors:

"Best 17-in. monitor" (Monthly PC Magazine, Japan). *"Best overall performance"* (Soft & Micro Magazine, France). *"Symbol of Excellence Award"* (CETDC/ Business Week Asia, Taiwan). *"Best Display Products"* (CompuTex/Byte, Taiwan).

Not only does the larger, flat-square tube give you more display area for Windows®, an ultra-fine .26mm dot

pitch and flicker-free 1280 x 1024 at 75Hz resolution bring your graphics and CAD apps to life as never before.

Users thrive on the ergonomic design; anti-glare, anti-reflection, anti-static screens; and full-featured digital touch-panel that lets you control everything right from the front.

These new low-radiation (MPR II-compliant) "green" monitors use only five watts of power when "on" but inactive. That's six times better than even the US EPA's own Energy Star guidelines.

So how did we get so big so fast? Simply by giving you more for less. For more information, call your nearest CTX office.



CHOICE OF THE PROS

USA Headquarters 20530 Earlgate Street, Walnut, CA 91789, 909-595-6146, Fax 909-595-6293 Technical Support 1-800-888-2012 BBS 909-594-8973 **Southern Region** 6624 Jimmy Carter Blvd., Norcross, GA 30071, 404-729-8909, Fax 404-729-8805 **Eastern Region** 481-A Edward Ross Drive, Elmwood Park, NJ 07407, 201-646-0707, Fax 201-646-1998 **Midwestern Region** 500 Park Blvd., Ste. 295C, Itasca, IL 60143, 708-285-0202, Fax 708-285-0212 **Southwestern Region** 1225 E. Crosby Rd., Ste. A21, Carrollton, TX 75006, 214-416-9610, Fax 214-245-7447.



©1994 CTX International, Inc. All brand names are trademarks or registered trademarks of their respective owners.
*Official 1993 Monitrak U.S. monitor sales research.

CIRCLE 329 ON READER SERVICE CARD

INTRODUCING A COMPUTER
WELL ENGINEERED.
ACTUALLY IMPROVES WORK.



TER SO
IT
TH AGE.



One of the most impressive features of the Deskpro XL is its future. Its upgradeability, expandability and flexibility (and countless other Compaq-engineered abilities) are all designed to protect your investment.

If you use a powerful computer, you know how it works: The day you bought your last machine was the day you started thinking about your next one. For that reason, we'd like to introduce you to a computer you can always look forward to—the new Compaq Deskpro XL.

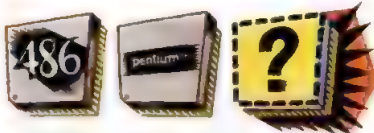
Basically, we've designed the Deskpro XL to be everything you could ever want in a high-

performance desktop computer.

A new high at the high end. So not only did we build in our own industry-leading technologies, we

added the flexibility and expandability that will make it possible for you to take advantage of advances still to come.

Deskpro XL's powerful PCI local bus, with integrated 32-bit



It's fast. Oh, is it fast. And the good news is, it will only get faster. The Deskpro XL's advanced architecture makes it easy to upgrade to future processors—so you'll be able to buy more speed without buying a new computer.

It's showtime. Spectacular graphics capabilities we built into the Deskpro XL, combined with the VESA Advanced Feature Connector, lay the groundwork for high-end design work and video conferencing.



options. You also get super-fast QVision PCI graphics with crisp 1280 x 1024 resolution. So with the Deskpro XL, you enjoy maximum performance today, with a door wide open for future growth.

Standard equipment, of course, includes the Compaq commitment to quality, dependability and value. Which comes in the form of our free three-year warranty* and our free seven-day, 24-hour support.

The Deskpro XL makes upgrading a lot easier with its Plug and Play capabilities. Servicing is a snap, too—no special tools required.



Our Vocalyst keyboard has a built-in speaker, microphone and controls for Business Audio—so the complete power of business communication will always be right at your fingertips.

The Deskpro XL starts at \$2,599** and is available now at your nearest authorized Compaq reseller. If you'd like more details via fax, call us at 1-800-345-1518, select the PaqFax option and request document #4052. You'll find that the future has never looked better.

COMPAQ

©1994 Compaq Computer Corporation. All Rights Reserved. Compaq and Deskpro Registered U.S. Patent and Trade mark Office. Vocalyst is a trademark and PaqFax is a service mark of Compaq Computer Corporation. Headline News is a registered service mark of Cable News Network, Inc. Pentium and the Intel Inside logo are registered trademarks of Intel Corporation. *Certain restrictions and exclusions may apply. Monitors, battery packs and certain options are covered by a one-year warranty. Call the Compaq Customer Support Center and select the PaqFax option for more details. **Estimated selling price; actual pricing may vary.

HARDWARE

17-Inch Monitors

Windows-based software utility for adjusting color. The software is easy to use and allows user settings to be stored with meaningful names rather than numbers. The utility also provides power-saving capabilities whether or not you have an Energy Star computer system. Even without the software, the Elite's front-panel digital controls are straightforward and include pincushioning and trapezoidal and tilt adjustment. The Elite also comes with a three-year warranty.

► **SuperScan Elite 17.** Estimated street price: \$1,049. Other 17-inch model: Super 17S, \$795. Nissei Sangyo America/Hitachi, 100 Lowder Brook Dr., Westwood, MA 02090; 800-441-4832, 617-461-8300; fax, 617-461-8665.

Circle 506 on reader service card

Nokia Display Products Inc.

PC EDITORS' CHOICE
Multigraph 447X

BY JOHN R. QUAIN

Nokia has developed a reputation as one of the top-tier display makers in recent

years. Graphics, CAD, and DTP professionals looking for a 17-inch monitor won't be disappointed with the company's Multigraph 447X. It commands a higher price than most—\$1,199 street, \$1,075 retail—but the unit's powerful mix of features and performance have earned it an Editors' Choice.

Based on Sony's flat-square Trinitron tube, the Nokia had the best misconvergence scores of all the monitors in this roundup; color fidelity and maximum usable brightness results were excellent. On subjective tests, the Nokia appeared distinctly brighter than most of the other monitors did. Fine, 1-pixel-wide lines were easily distinguishable.

The Multigraph

447X easily manages 1,280-by-1,024 resolution at a flicker-free vertical refresh rate of 76 Hz and delivers 1,024-by-768 at an impressive 95 Hz. Controls are simple to use, with only two pairs of front-panel buttons responsible for all digital adjustments. On-screen controls simplify pin-



On the Multigraph 447X, two pairs of buttons and an on-screen menu are used to make adjustments. All the front-panel controls, including pincushioning, trapezoidal, orthogonality, tilt, and color-matching adjustments, are also offered on-screen.

Smart, Simple Printer Sharing

- Connects from 3 to 32 computers and printers
- DOS/Windows compatible
- High speed and error free even at 1200'
- No software changes required
- Simple installation. Just plug SmartPrint modules into your computer and printer parallel ports and snap in the supplied wires. That's it!

Questions?

Call us at 1-800-368-7737
(Outside US/Canada 909 945 5600)

or for instant info by fax call 24 hrs
1-800-373-3600 and ask for #1012

SmartPrint™
Printer Sharing Network

Order from any computer dealer. Distributed to dealers by Ingram Micro and Tech Data.
Made in USA by Dresselhaus
GSA Scheduled • 3 year warranty



	Part Number	Suggested Retail
Starter Kit for 2 computers/1 printer	PSN1	\$ 199
Add-on Computer Module	PSN2	59
Add-on Printer Module	PSN3	69

1.8 MILLION STRONG.

133 YEARS YOUNG.

1 • 8 0 0 • 8 5 4 • C L U B



BOYS & GIRLS CLUBS
OF AMERICA

The Positive Place For Kids.

HERE'S THE SMARTEST 15" COLOR MONITOR ON THE MARKET.



- ▶ **Precise Digital On-Screen Display**
Image easily adjusted with microprocessor-based digital controls
- ▶ **Easy On The Eyes**
Flat-Square, Non-Glare picture tube with .28mm dot pitch
- ▶ **High Resolution**
Maximum resolution 1280 x 1024, Non-Interlaced
- ▶ **Reliability-Tested With 50,000 Hour MTBF**
One year warranty supported nationally by Magnavox
- ▶ **Autoscanning Capability**
Horizontal scanning from 30 to 66KHz, Vertical from 50 to 110Hz
- ▶ **Switchable Macintosh® Adapter Included**



\$399 MSRP

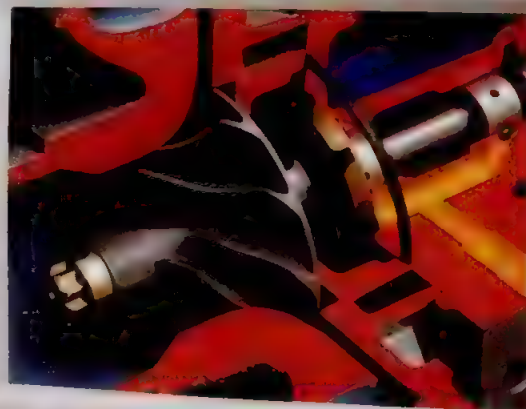
MAGNAVOX HAS MONITORS TO MEET ANY APPLICATION.

MODEL#	7BM749	CM2080	CM2089	CM2099	CM4015	CM4017	20CM64
SCREEN SIZE	14"	14"	14"	14"	15"	17"	20"
MAX RESOLUTION	640 x 480 Non-Interlaced	640 x 480 (Mac) Non-Interlaced	1024 x 768 Interlaced	1024 x 768 Non-Interlaced	1280 x 1024 Non-Interlaced	1024 x 768 Non-Interlaced	1280 x 1024 Non-Interlaced
TYPE	Mono VGA	Color Mac™	SVGA	EVGA	EVGA	EVGA	Hi-Res
DOT PITCH	N/A	.28	.28	.28	.28	.31	.31
SCAN RATE H	31.5KHz	35.0KHz	31.5/35.2/35.5	30-18KHz	30-66KHz	30-58KHz	30-64KHz
SCREEN	Non-Glare	Glossy	Non-Glare	Non-Glare	Non-Glare	Non-Glare	Glossy
MFG. SUG. RETAIL	\$119	\$299	\$269	\$299	\$399	\$749	\$1,199

The Energy Star emblem does not represent EPA endorsement of any product or service. © 1994 Philips Consumer Electronics Company. A Division of Philips Electronics North American Corporation. Macintosh is a registered trademark of Apple Computer, Inc.

CIRCLE 246 ON READER SERVICE CARD

Success, Power and Creativity. It's Your Image.



Make it a reality with a ViewSonic monitor. And, since 17" monitors (15.7" viewable diagonal) are the size of choice by most professionals, we offer one for every budget and application. Take pride in knowing the image on your screen is bright, crisp and picture-perfect. Don't settle for less.

In addition to edge-to-edge focus, compatible with resolutions up to 1600 x 1280, and vertical refresh rates as high as 160Hz, our **NEW** ViewSonic 17 and 17G monitors feature OnView. This control system allows you to adjust the image via the on-screen menu, including color matching. Compare specs, price and performance — you'll See The Difference!

During the past year, our monitors have received 16 awards from major computer publications. Plus, ViewSonic was named in *Inc.* magazine's 1992 and 1993 top 500 fastest growing companies. In keeping with our commitment for environmental and energy conservation, these monitors surpass the strict Swedish MPR-II standards for low radiation and support the EPA's Energy Star program.

ViewSonic monitors... designed with your image in mind.

PC and MAC compatible.



	ViewSonic 17 17"	ViewSonic 17G 17"	ViewSonic 17E 17"
Screen Size*	17"	17"	17"
Dot Pitch	0.27mm	0.28mm	0.28mm
Max. Resolution	1600 x 1280	1280 x 1024	1280 x 1024
Max. Refresh	160Hz	160Hz	90Hz
Horiz. Frequency	30-82kHz	30-64kHz	30-64kHz
ViewMatch™ Color Control	Yes	Yes	Yes**
OnView™ Controls	Yes	Yes	No
Flat Square Screen	Yes	Yes	Yes
MSRP	\$1,045	\$945	\$865

* Diagonal viewable screen measured 17" from the front bezel to the back bezel.

** Color temperature switching from 6500 K to 9000 K.



ViewSonic®
See The Difference!™

Tel: (800) 888-8583 or (909) 869-7976

Fax: (909) 869-7958

Call FaxSonic at (909) 869-7958 (fax-on-demand)

Request Doc. 147 (17E), 148 (17G), 152 (17)

Applelink: VIEWSONIC Compuserve: 73374, 514

ViewSonic and the ViewSonic logo are registered trademarks of ViewSonic Corporation. All other trademarks are the property of their respective owners. © 1993 ViewSonic Corporation. All rights reserved.

CIRCLE 118 ON READER SERVICE CARD

cushioning, trapezoidal, and color-temperature adjustments. Those with special needs will be pleased to find that the monitor has BNC connections, in addition to providing Energy Star, VESA DPMS, and MPR II compliance.

A three-year warranty rounds out the excellent package. In fact, the only shortfall is the rather confusing multilingual owner's manual. You may have to spend a few hundred dollars more to get Nokia's bright picture on your desktop, but users with DTP or CAD requirements will find the Multigraph 447X well worth the price.

► **Multigraph 447X.** List price: \$1,199. Other 17-inch model: Valuegraph 447L, \$695. Nokia Display Products Inc., 3000 Bridgeway Blvd., Sausalito, CA 94965; 800-296-6542, 415-331-0322; fax, 415-331-6211.

Circle 507 on reader service card

Optquest Inc.

• Optquest 4000TC

BY STEPHEN CHAN

With its bright display, sharp picture, good energy-saving features, and attractive retail price (\$849 street, \$1,389 list), the Optquest 4000TC would be an ideal monitor for mainstream business users. One flaw, however, dampens our enthusiasm: Our sample monitor exhibited the worst misconvergence we encountered in this roundup (though its score of 0.18 mm was still acceptable), and there are no user controls to correct the problem.

The Trinitron-equipped Optquest had respectable Average MTF and Maximum Usable Brightness scores and presented a bright, well-focused picture. Colors were good, though not saturated enough for color-intensive graphics work. The problem area was the bottom of the screen, where a halo effect was visible on our test pattern.



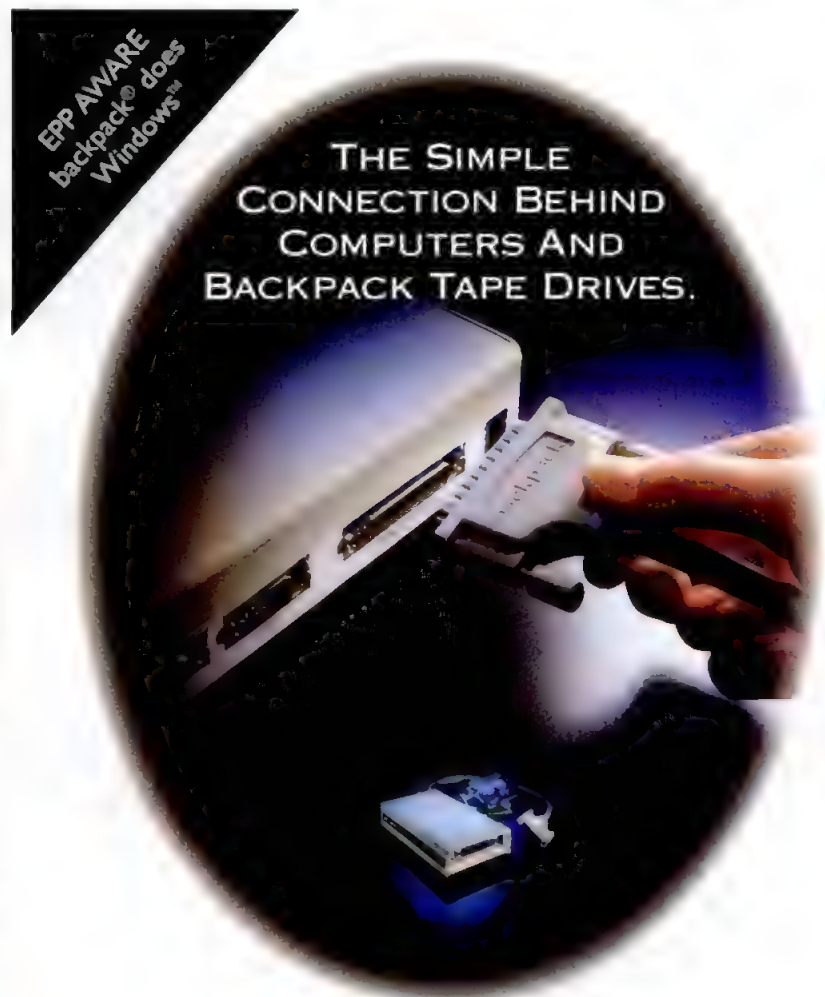
Optquest includes software that powers down the monitor in various stages for energy saving, even with many video cards that are not VESA DPMS-compliant. The software is easy to install and use, and it works in both DOS and Windows. The Optquest offers a basic mix of analog and digital controls, including color matching and pincushioning.

Only the misconvergence problem on

our test unit keeps us from heartily recommending the Optquest 4000TC to business users.

► **Optquest 4000TC.** List price: \$1,389. Other 17-inch models: Optquest 4000DC, \$1,299; Optquest 4000DS, \$1,199. Optquest Inc., 20490 E. Business Pkwy., Walnut, CA 91789; 800-843-6784, 909-468-3750; fax, 909-468-3770.

Circle 508 on reader service card



It's fast. It's small. It's reliable. It's incredibly compatible.

Backpack is the best selling parallel port tape drive on the market. We'd like to tell you why.

With Backpack, tape backup is quick and simple. Just plug it into your printer port and it's ready to use. No hardware conflicts, no slots required. One model fits all IBM PCs, compatibles and portables, regardless of CPU speed.

Backpack can store up to 250MB on a tape using data compression, is completely QIC80 compatible, and reads QIC40 tapes.

With its compact size and 1Mbps transfer rate, Backpack is the smallest and fastest parallel port tape drive you can buy.

Micro Solutions is dedicated to the perfection of backup technology.

CD-ROM, hard drive, and diskette Backpack drives are also available. Call today for ordering information and a dealer nearest you.

Telephone 815.756.3411 FAX 815.756.2928

MicroSolutions

132 West Lincoln Highway DeKalb, IL 60115

CALL TOLL FREE 1-800-293-1214
CIRCLE 855 ON READER SERVICE CARD



One thing keeps showing

When you want the fastest adapter on the planet, there's only one thing to ask for: EtherLink® III with Parallel Tasking™ technology. From 3Com.

There's simply no faster way to run your network. And that's not just our opinion. LANQuest Labs® has said again that Parallel Tasking from 3Com continues to be the fastest Ethernet adapter technology available.

Yet, for all this speed, an EtherLink III adapter installs in record time — more than six times faster than other leading adapters, according to LANQuest Labs. With 3Com's AutoLink™ software, just a single menu selection completes the installation, including configuring the adapter and installing the Netware® client files. And with 3Com's Transcend™ WorkGroup Manager you



up in all the fastest places.

can manage both adapters and hubs from one integrated Windows-based application.

Is it any wonder that no other adapter has sold more quickly, been accepted more widely, and praised more highly than EtherLink III with Parallel Tasking?

But then, you always knew you were traveling in fast company, didn't you?

For more information and for your free LANQuest Labs *Guide to Benchmarking Network Adapters*, call 1-800-NET-3Com.



Orchestra MultiSystems Inc.

• The Tuba

BY STEPHEN CHAN

The Tuba, from Orchestra MultiSystems, is a bright, fairly sharp monitor with one especially redeeming quality: its very low street price of \$669 (\$699 list). A no-frills solution, this unit should fill the bill for budget-minded business users.

The Tuba's performance was average or slightly below on our tests. Text was acceptably legible, and the unit should prove fine for word processing and spreadsheet applications. Our only notable complaint concerned its very obvious vertical pincushioning error of 0.78 mm; The Tuba does not provide controls to correct it. On the plus side, the Tuba delivers an excellent scanning range (76 Hz at 1,024-by-768) for a flicker-free image. The Tuba comes with a mix of basic analog and digital controls; other than the usual brightness, contrast, and positioning controls, only a degaussing button is offered.

Orchestra provides a three-year warranty and promises that The Tuba will be VESA DPMS- and Energy Star- compliant by the time this article appears. The company also plans to have available a \$469 17-inch offering, The Timpani. Dot pitch for The Timpani is a whopping 0.41 mm, as opposed to The Tuba's 0.26 mm.

If you're a business user looking for more screen real estate for less money, The Tuba may be playing your tune.

► **The Tuba.** List price: \$699. Orchestra MultiSystems Inc., 1220 Industry St., Garden Grove, CA 92641; 800-237-9988, 714-389-3861; fax, 714-891-2661.

Circle 509 on reader service card



Orchestra Tuba

Packard Bell Electronics Inc.

EDITORS' CHOICE
PB8517SVGM

Panasonic Communications & Systems Co.

• PanaSync C1791E

BY BRIAN FIKES

The main difference between these two monitors, both of which are based on the same Mitsubishi flat square tube, is price: \$650 (list and street) for Packard Bell's PB8517SVGM versus \$999 list (\$799 street) for Panasonic's PanaSync C1791E.



PB8517SVGM, PanaSync C1791E

With good performance and plenty of features for monitors in this price range, either is a good choice for business or home users. The Packard Bell PB8517SVGM earned one of our two Editors' Choice designations because of its spectacularly low list and street prices and solid performance.

Both monitors came in well above the average on all of our SpotSeeker performance tests. They showed excellent focus (placing in the top quarter for MTF scores), displaying crisp, legible text. On both units the middle of the screen was sharper than the edges, though this should not hamper users of productivity applications. Misconvergence and pincushioning scores were also very good. The Packard Bell was the brighter of the two and the second brightest of all the reviewed monitors (behind the Radius), though both should prove fine under harsh lighting conditions. The PanaSync had better overall color accuracy and spatial uniformity. Both deliver 1,024-by-768 resolution at an acceptable 72 Hz for a flicker-free image.

The Packard Bell and the PanaSync offer a good array of very similar on-screen software controls for monitors in

this class, including trapezoidal, orthogonal, and red and blue color adjustments. One minor difference: The Packard Bell's on-screen menu is larger. Both monitors have antiglare treatment and VESA DPMS-compliant power-saving modes. No software is offered to make use of DPMS if you don't have an Energy Star PC.

The PanaSync is priced low for a monitor with these performance results and features; any business user should be satisfied with it. With almost the same performance and features for \$150 less, the Packard Bell is an even better buy.

► PB8517SVGM.

List price: \$650. Packard Bell Electronics Inc., 31717 La Tienda Dr., Westlake Village, CA 91362; 800-733-5858, 818-865-1555; fax, 818-865-0176.

Circle 510 on reader service card

► **PanaSync C1791E.** List price: \$999. Panasonic Communications & Systems Co., 2 Panasonic Way, Secaucus, NJ 07094; 800-742-8086, 201-348-7000.

Circle 511 on reader service card

Philips Consumer Electronics Co.

• Brilliance 1720

Sigma Designs Imaging Systems Inc.

• ErgoView 170

BY BRIAN FIKES

The \$1,399 Brilliance 1720 (\$1,170 estimated street) and \$1,599 ErgoView 170 (\$1,075 street) are high-end monitors aimed at the professional graphics, desktop publishing, and CAD segments. Though we found the feature sets and color quality to be excellent, the overall performance of these monitors is not as good as others we tested in this price range.

When it comes to color accuracy, the Brilliance beat every other monitor we looked at. Colors were bright, and our test photo looked top-notch. Performance elsewhere was less brilliant. The display was acceptably sharp—text was easy to read—but at 20.1 foot-lamberts,

HARDWARE

17-Inch Monitors

the Maximum Usable Brightness score is borderline. Similarly, its horizontal pincushioning score of 0.69 mm is just above our 0.60 mm cutoff for acceptability.

The ErgoView shares the Brilliance's excellent color characteristics, placing third overall for color accuracy. It outperformed the Brilliance with a brighter display, less pincushioning error, and the second-best MTF scores in this entire roundup. Overall,

the ErgoView places ahead of the Brilliance, squarely in the middle of our review pack. But the ErgoView doesn't come with any power-saving features and offers only a one-year warranty; the Brilliance is Energy Star- and VESA DPMS-compliant and comes with a three-year warranty.

A good selection of front-panel con-

trols is offered, from the usual brightness, contrast, size, and position to pincushioning and trapezoidal adjustment. There are no on-screen controls, but a small LCD panel on the bezel does display the name of the function you are adjusting. The readout also indicates the resolution and vertical scanning frequency the monitor is running at. The units deliver 1,024-by-768 at a superb 100 Hz and 1,280-by-1,024 at 76 Hz.

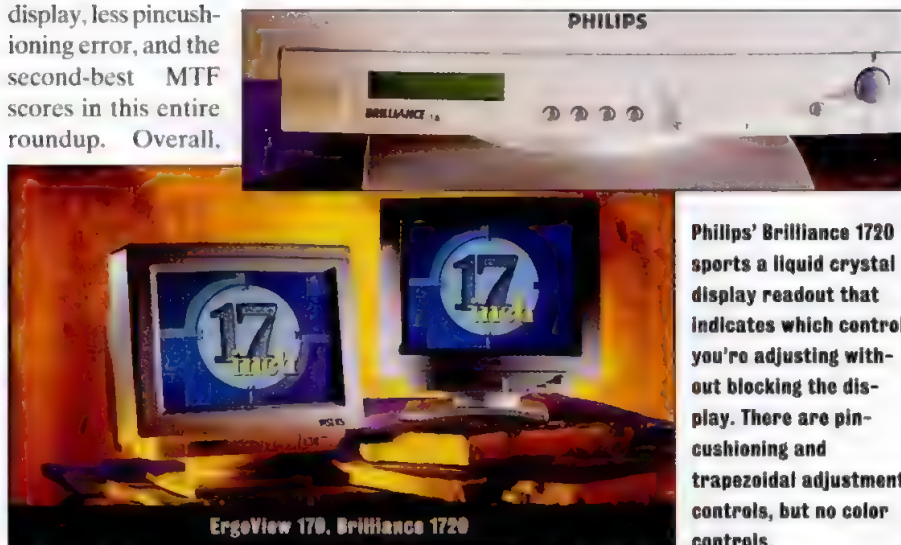
With their excellent color quality, these monitors could serve the graphics professional well. Still, we found comparable color quality and better overall picture quality elsewhere at this price.

► **Brilliance 1720.** List price: \$1,399. Philips Consumer Electronics Co., One Philips Dr., P.O. Box 14810, Knoxville, TN 37914-1810; 800-835-3506, 310-217-1300; fax, 310-217-1833.

Circle 512 on reader service card

► **ErgoView 170.** List price: \$1,599. Sigma Designs Imaging Systems Inc., 46515 Landing Pkwy., Fremont, CA 94538; 800-437-4624, 510-770-2900; fax, 510-770-2993.

Circle 513 on reader service card



Phillips' Brilliance 1720 sports a liquid crystal display readout that indicates which control you're adjusting without blocking the display. There are pincushioning and trapezoidal adjustment controls, but no color controls.



One thing keeps showing up in all the fastest places.

Nothing's faster for the laptop than the new EtherLink® III PCMCIA adapter with Parallel Tasking™.

It's 45 to 110 percent faster than any other notebook adapter, according to the latest LANQuest Labs® benchmark study. It's easier to use, too, with AutoLink™ auto-installation software, and Card Services support that includes the best Hot Swap capability.

For the fastest and easiest notebook adapters, look to the EtherLink III PCMCIA adapter. We bet you'll quickly wonder how you lived without it. To learn more, or to order your \$99* evaluation card, call 1-800-NET-3Com.



NETWORKS THAT GO THE DISTANCE

HARDWARE

17-Inch Monitors

Radius Inc.

• PrecisionColor Display/17

Sony Electronics Inc.

• Multiscan 17se

BY STEPHEN CHAN

Sony's Multiscan 17se (\$1,249.95 list) and Radius's Macintosh-oriented PrecisionColor Display/17 (\$1,299 list) proved to be sharp, bright monitors suitable for demanding graphics and DTP professionals. Street prices around \$1,050 make these units a good

Though the Sony is bundled with the PC user in mind, the Radius is geared toward Macintosh users: It comes with Mac utilities, a Mac video cable (a conversion adapter is included), and primarily Mac timings for the factory presets.

There are plenty of front-panel digital controls, including pincushioning, rotation, convergence, and color temperature, hue, saturation, and intensity. Brightness and contrast buttons are used for other settings as well, which can prove confus-

CA 95131; 800-227-2795, 408-434-1010; fax, 408-434-0127.

Circle 514 on reader service card

► **Multiscan 17se.** List price: \$1,249.95. Sony Electronics Inc., 3300 Zanker Rd., San Jose, CA 95134; 800-352-7669, 408-894-0225; fax, 408-955-5171.

Circle 515 on reader service card

Samsung Electronics America Inc.

• SyncMaster 17GL

• SyncMaster 17GLs

BY KATIE BARNES

With its completely revamped 17-inch offerings, Samsung Electronics America delivers very good monitors for a range of uses. The SyncMaster 17GL (\$999 list, \$859 street) is a moderately priced monitor ideal for the business user. The SyncMaster 17GLs (\$1,199 list, \$995 street) delivers features and performance suitable for demanding graphics and DTP work at a very competitive price.

The SyncMaster 17GL was an average performer overall, with picture quality suitable for office productivity applications. Its etch-process antiglare treatment was at least partly to blame for the unit's subpar Average MTF score; images (especially text) were somewhat blurred. Still, the display is acceptable for a monitor in this class.

The SyncMaster 17GLs, with a 0.26-mm dot pitch (versus 0.28 mm for the 17GL), performed well above average on many of the objective and subjective tests. It was especially strong on our RMS Misconvergence tests, where it tied for first



Precision Color Display/17, Multiscan 17se

Controls on the Radius PrecisionColor Display/17 and the Sony Multiscan 17se include pincushioning, rotation, convergence, and color attributes. Brightness and contrast buttons double as other controls.

value in the high-performance sector.

Both possess Sony's latest Trinitron tube and a custom ASIC (application-specific integrated circuit) that automatically adjusts for some geometry problems over a continuous range of horizontal frequencies. If the monitors receive a video timing that is not one of the factory presets, there should be no need to adjust manually for certain horizontal geometric distortions, such as keystoneing.

Both monitors performed well on nearly all objective and subjective tests. Sharp text and well-saturated colors make these monitors fine choices for general business applications or color graphics work. Refresh rates are excellent: 75 Hz for the Radius and 100 Hz for the Sony at 1,024-by-768. With an impressive Maximum Usable Brightness score of 39.4 foot-lamberts, the Radius emerged as the brightest monitor we reviewed. The Sony also ranked high in Maximum Usable Brightness (35.3 foot-lamberts). The Radius fell below the average for RMS Misconvergence, though its score of 0.14 mm is still within our accepted range.

ing. On-screen controls would be a welcome addition.

Both units are Energy Star-certified and VESA DPMS-compliant. Buying the Sony gets you a three-year warranty (the CRT is covered for two years). Radius offers one-year "worry-free" warranty service that guarantees overnight replacement of the display.

► **PrecisionColor Display/17.** List price: \$1,299. Radius Inc., 1710 Fortune Dr., San Jose,



SyncMaster 17GL and SyncMaster 17GLs

The front-panel controls on Samsung's SyncMaster 17GLs consist of buttons and thumbwheels. They include pincushioning, trapezoid, parallelogram, and color controls such as selection, saturation, and hue.

place with the Nokia Multigraph 447X. Sharp lines and images with very little haloing make this monitor a good choice for graphics and DTP chores. The SyncMaster 17GLs was also an admirable performer on our MTF tests, showing crisp text and images. The ARAS antiglare treatment helped here: Colors were bright and well saturated. The SyncMaster 17GLs's greater bandwidth allows you to run at 1280-by-1,024 at 76 Hz; the 17GL delivers 76 Hz only up to 1,024-by-768.

Both monitors offer a great amount of adjustability. A combination of buttons and thumbwheels provides the controls with a good feel; the variable adjustments are neither too coarse nor too slow. The SyncMaster 17GLs's on-screen programming software took some getting used to, though: The window blocks most of the image you're trying to adjust. The SyncMaster 17GL has controls you might not expect in this price range, including pin-cushioning and trapezoidal and parallelogram adjustments. The 17GLs adds color selection, saturation, and hue.

Both monitors are equipped with En-

ergy Star- and VESA DPMS-compliant power-saving capabilities and come with exceptional documentation. The manuals are well illustrated with detailed instructions on where to get service. With these units, Samsung has become a tough competitor in the 17-inch-monitor market.

► **SyncMaster 17GL.** List price: \$999. **SyncMaster 17GLs.** List price: \$1,199. Samsung Electronics America Inc., 105 Challenger Rd., Ridgefield Park, NJ 07660; 800-726-7864; fax, 201-229-4000.

Circle 516 on reader service card

Sceptre Technologies Inc.

● Sceptre CL-617GL+

BY JOHN R. QUAIN

At a \$699 street price (\$895 list), the Sceptre CL-617GL+ is one of the lowest-priced monitors in our roundup—but you'll have to decide if the features and performance hit are worth the savings.

The Sceptre is not a performance leader. Our sample unit lacked the image sharpness of other monitors we reviewed and brought in one of the worst Average



MTF scores. In eyes-on tests, the monitor's Microsoft Windows screens appeared distinctly grayer than most of the competition, thanks in part to below-average brightness and poor color fidelity. In other performance areas, Sceptre's 17-inch entry is about average, earning high marks only on the RMS Misconvergence tests.

Getting a lower price also means enduring some minor quirks, such as an awkwardly arranged set of image controls. Analog brightness and contrast dials are on the right side of the monitor, the power button is underneath the front, and

PERSONAL OFFICE SOLUTIONS
REMOTE OFFICE SOLUTIONS
STACKABLE HUBS
TOKEN RING ADAPTERS
WAN BACKBONE SOLUTIONS



One thing keeps showing up in all the fastest places.

Install the world's fastest adapter and you will come to a very quick conclusion: No other adapter is faster, and no other adapter is easier to use.

3Com's EtherLink® III adapters with Parallel Tasking™ come with AutoLink™, the fastest and easiest installation software. With 3Com's AutoLink, make a single menu selection and installation is complete, including installing the

Netware® client files. Three minutes is all it takes. Just dial **1-800-NET-3Com** for your free copy of LANQuest Labs™ ease-of-use benchmark report. And find out how EtherLink III can get you up to speed very quickly indeed.



CENTRAL SITE ROUTERS
WORKGROUP SOLUTIONS
SWITCHING HUBS
NETWORKS THAT GO THE DISTANCE

Shopping Around For A \$500 15" Flat Square Color Monitor? Check Us Out.

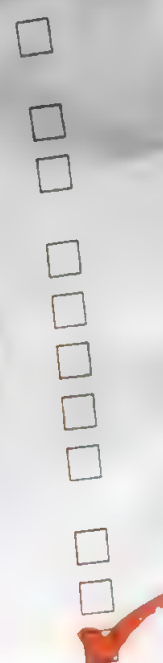
Required Features

High Refresh 1024 x 768
Non-Interlaced Resolution
Auto Calibration
Microprocessor-Based
Auto-Scanning
Color Calibration System
Digital User Controls
On-Screen User Controls
Compact, Lightweight Design
Dark Tinted, Optical Quality
Anti-Static, Anti-Glare Screen
Wide 100 MHz Video Bandwidth
Screen Safety Display
\$500 Street Price (Approximately)

Mitsubishi Diamond Pro® 15FS



Other Leading 15" Flat Square Model



The standard of excellence in 15" (14" V) flat square color monitor design has just taken a quantum leap forward. Introducing the new Mitsubishi Diamond Pro 15FS. More monitor for your money.

For more information on the Diamond Pro 15FS, call us at 1-800-843-2515 in the U.S. and Mexico. In Canada call 1-800-387-9630.

For immediate product specifications, call Mitsubishi Qwikfax at 1-800-937-2094.



17-Inch Monitors

the size and position buttons are located on the tilt/swivel stand. The terse manual doesn't provide much guidance. In its favor, the unit is MPR II-, Energy Star-, and VESA DPMS-compliant.

The Sceptre lacks many of the highlights of more expensive monitors: on-screen control displays, BNC connectors, and the ability to display noninterlaced images at resolutions higher than 1,280-by-1,024. Of course, a limited feature set is tolerable in a bargain-priced 17-inch monitor. Combined with a disappointing picture, however, these drawbacks mean the Sceptre CL-617GL+ isn't the bargain it initially appears to be.

► **Sceptre CL-617GL+**. List price: \$895. Other 17-inch models: CL-617G, \$795; CL-617GL, \$829. Sceptre Technologies Inc., 16800 E. Gale Ave., Industry, CA 91745; 800-788-2878, 818-369-3698; fax, 818-369-3488.

Circle 517 on reader service card

Tatung Co. of America Inc.

• Tatung Omniscan CM17MKR

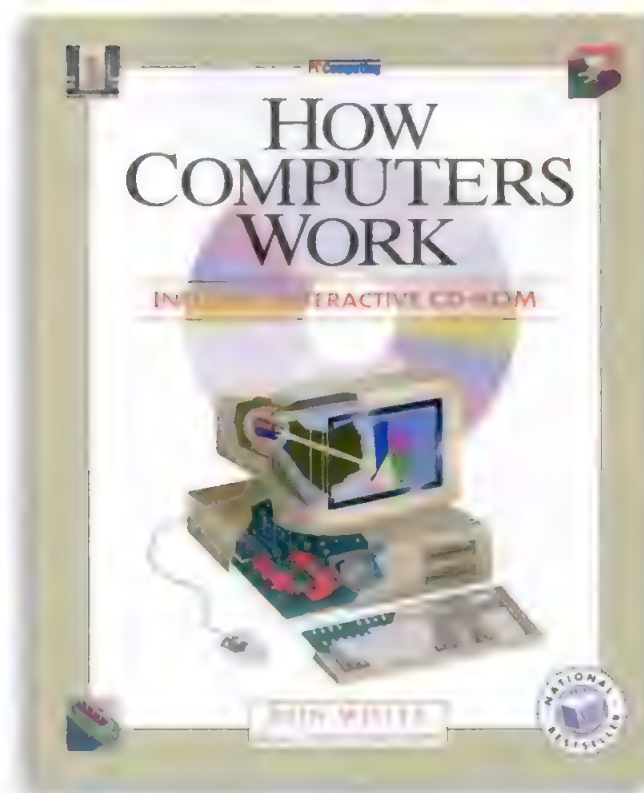
BY STEPHEN CHAN

At \$850 (\$995 list), the Tatung Omniscan CM17MKR is a good choice for business users looking for a moderately priced, solid performer. Its picture should prove adequate for word processing and spreadsheet work, but we found pincushioning error that would hinder its usefulness for serious graphics work.

Strong scores on our Average MTF and RMS Misconvergence tests translated into a display with good focus and overall clarity. The provided controls, however, could not eliminate the horizontal pincushioning error we detected. With a score of 0.75 mm, the Tatung was beyond our acceptable threshold of 0.60 mm. The unit was also not particularly bright.

The basic set of front-panel digital controls—brightness, contrast, position, and pincushioning—are easy to operate. A handy LED window displays not only what mode the monitor is in but also the horizontal frequency detected and a scale (from 0 to 63) for each of the control-panel adjustments. The Tatung delivers 1,024-by-768 and 1,280-by-1,024 at a comfortable 75 Hz and comes with a two-year warranty on parts and labor.

Click Click,



ISBN 1-56276-250-8 Price \$39.95

**PC/Computing How Computers Work
CD-ROM/Book extravaganza from Ziff-Davis Press.**

WHIZ



Click your way through an electrifying multimedia voyage to the heart of the computer with *How Multimedia Computers Work*—a unique CD-ROM packaged with the classic best-selling book *PC/Computing How Computers Work*.

In *How Multimedia Computers Work*, fun, fast-paced, fascinating tours of your computer's incredible



innards combine state-of-the-art 3D animation with lively dialog and music for a richly interactive sensory feast. Also included are provocative video interviews with well-known computer industry figures—plus tons of computing tips from the top authors at Ziff-Davis Press. Teamed up with a book that has already shown legions of computer users what makes their machine tick, *How Multimedia Computers Work* is a real whiz-bang experience that's sure to make you see your computer in a whole new light.

Ask your favorite bookseller for *PC/Computing How Computers Work* with *How Multimedia Computers Work* on interactive CD-ROM.

BANG

Ziff-Davis Press books are available at all fine bookstores,
or call 1-800-688-0448, ext. 223.



17-Inch Monitors



One welcome feature of the Tatung Omniscan CM17MKR is a front-panel LED that shows a scale from 0 to 63 for each of the control-panel adjustments. The LED also indicates the mode the monitor is in, as well as the horizontal frequency detected.

► **Tatung Omniscan CM17MKR.** List price: \$995. Other 17-inch model: Omniscan CM17MBR, \$925. Tatung Co. of America Inc., 2850 El Presidio Street, Long Beach, CA 90810; 800-827-2850, 213-979-7055; fax, 213-637-8484.

Circle 518 on reader service card

ViewSonic

- **ViewSonic 17**
- **ViewSonic 17G**

BY KATIE BARNES

One of the largest players in the 17-inch-monitor market, ViewSonic now offers a unit for every budget: the low-priced ViewSonic 17E (not available for this review; \$865 list), the midrange ViewSonic 17G (\$945 list, \$872 street), and the high-end ViewSonic 17 (\$1,045 list, \$945 street). Though the two units we looked at have decent picture quality and lead most competitors in features, their overall performance is unexceptional.



Viewsonic 17G, Viewsonic 17

The ViewSonic 17G is aimed at mainstream business users who need a better display and more controls than a no-frills monitor offers. Performance was average or below; sharpness, clarity, and color properties are acceptable for office chores, but there were noticeable convergence problems at screen edges and substantial moiré patterning that could not be corrected.

One highlight is the unit's easy-to-use on-screen controls, which give access to the usual brightness, contrast, and positioning, as well as trapezoidal adjustment, parallelogram, color tuning, color temperature, and frequency rate.

The ViewSonic 17, which is intended for high-end graphics, DTP, and CAD users, performed better but was still about average. The ViewSonic 17 had better misconvergence and pincushioning scores and better color accuracy than the 17G, but it was not as bright, and its brightness was not as uniform. The ViewSonic 17 also offers an adjustment to eliminate moiré patterning, and its antiglare treatment is excellent.

The ViewSonic 17 shares its sibling's excellent on-screen controls and adds moiré and rotation controls. It also has BNC and DSUB input connections (the ViewSonic 17G has only a DSUB port). The ViewSonic 17 also offers 1,280-by-1,024 resolution at 76 Hz, as opposed to the 17G's 60 Hz.

Both ViewSonic monitors are Energy Star- and VESA DPMS-compliant and come bundled with DOS- and Microsoft Windows-compatible OptiGreen software. This was originally developed for Optique monitors

and lets you take advantage of power-saving features even if you don't have an Energy Star PC or a DPMS-compliant adapter.

► **ViewSonic 17G.** List price: \$945. **ViewSonic 17.** List price: \$1,045. ViewSonic, 20480 Business Pkwy., Walnut, CA 91789; 800-888-8583, 909-869-7976; fax, 909-869-7958.

Circle 519 on reader service card

Wen Technology Corp.

• **Wen JK1775 Digital Control Color Monitor**

BY BRIAN FIKES

We were unimpressed with the Wen JK1775 Digital Control Color Monitor. The unit (\$999 list, \$890 street) offers only basic features, and its performance on our SpotSeeker tests was generally poor.

The original unit we tested had a vertical pincushioning score of 1.33 mm—more than double our acceptable threshold of 0.60 mm. The Wen also had the



Wen JK1775 Digital Control Color Monitor

worst RMS Misconvergence score of the group, approaching our acceptable cutoff of 0.20 mm, and the worst color accuracy, with similar colors blending into each other. A second sample unit had better vertical pincushioning results (0.65 mm) but unacceptable color-analyzer results. We here report the results of the original monitor, as it performed better overall.

On the positive side, the Wen's MTF scores were above average, and its picture was acceptably bright and sharp. □

► **Wen JK1775 Digital Control Color Monitor.** List price: \$999. Wen Technology Corp., 11 Clearbrook Rd., Elmsford, NY 10523; 800-377-4936, 914-347-4100; fax, 914-347-4128.

Circle 520 on reader service card

IBM now offers a full line of hard drives.

Even for (gulp!) the clones.



3.5 inch Value Drive

At IBM, we've been refining new storage technology since we invented the Winchester drive in 1973. Since then, we've seen lots of people using all kinds of disk drives in lots of different ways, in lots of different computers.

And we said, "Hey, why can't they all be IBM drives?"

Well, now they can. From 270-728 MB* AT and SCSI drives for desktops to 1.0GB and 2.0GB drives for LANs, workstations and performance-oriented systems, we offer one of the widest ranges of reliable and technologically advanced hard drives in the computer industry. And recently, we added 3.5-inch 127MB and 5.25-inch 1.3GB optical drives to further complement your storage needs. All available for non-IBM systems at very competitive prices.**

To order, call IBM PC Direct* at 1 800 426-8669, or contact your IBM marketing representative or your nearest IBM authorized dealer!



IBM Hard Drives	Interface	Capacity	Avg. Seek	RPM
3.5" Value HDD	SCSI, IDE	270MB, 364MB, 527MB, 728MB	12ms	4500
3.5" Performance HDD	SCSI, IDE	1.0GB	8.5ms	5400
3.5" Performance HDD	SCSI	2.0GB	9.2ms	5400



*MB stands for Million Bytes. Total user accessible capacity may vary slightly based on operating system environment. **Some configurations may not be compatible. Refer to minimum systems requirements. †For the name of an IBM authorized dealer, call 1 800 426-9387. Hours of availability are M-F, 9:30am to 9:00pm EDT. In Canada, call 1 800 467-7999. Options by IBM is a trademark and IBM is a registered trademark of the International Business Machines Corporation. PC Direct is a registered trademark of Ziff Communications and is used by IBM under license. © 1991 IBM Corp.

Finally, instant **global communications** for **your color documents.**

(Without the microwave tower.)



Fax, copy and scan in **COLOR** with Scanfx.

In a world of global digital information distribution like **multimedia CD-ROMs, Internet and ISDN**, why isn't sending a color document to people a simple task?

Suddenly it is. Scanfx lets you fax color documents like that picture of me and Barbara partying at the beach to anybody in the world with a PC and a fax/modem.

All it takes is inserting the document, dialing the number, and pressing the "FAX" key. What? No clicking? No mousing around? **Great!**

Color Copies and OCR, Too!

And for those who need to make color copies like me, Scanfx lets you produce copies right at your desktop by touching a single button. Scanfx even features One-Touch OCR technology — just touch an OCR button on the front panel



and watch as Scanfx scans your documents, converts them to text, then launches your word processor. The converted documents appear on-screen, ready for editing. **Wow! That used to take me an hour!**

Naturally, Scanfx is an intelligent desktop scanner. Use it to scan 17 million colors at resolutions up to 1200dpi.

To take advantage of Scanfx, all you need is a printer and a fax/modem. **Already have 'em!** A color printer is required for color copies.

Scanfx comes with everything else you need; interface card, documentation, cables and drivers. **(Even a great software bundle with both photo editing and OCR software included!)**

And with a retail price of \$799, Scanfx is not only simple. It's affordable. **It's cool!**

Well said. Scanfx.

1-800-685-8088

 **Plustek**
The Ultimate in Office Imaging.

No more boring slide shows! These ten presentation graphics software packages have mastered ease of use, but for most of them, integrating multimedia is still a challenge.



Captivated

DESKTOP PRESENTATIONS

Audience

IN THIS REVIEW

Action! for Windows.....	260
Astound for Windows.....	264
Bravo!.....	266
Compel.....	271
Freelance Graphics for OS/2.....	272
Freelance Graphics for Windows.....	272
Harvard Graphics for Windows.....	276
Micrografx Charisma.....	280
Microsoft PowerPoint.....	282
WordPerfect Presentations for Windows.....	287
LCD Projection Panels: Through a Glass Brightly.....	262
Presentation Alternatives.....	270
Performance Tests.....	274
Looking Ahead: Impact and Persuasion.....	278
Summary of Features.....	284

By Lori Grunin

The trends we've seen in desktop presentation software over the past several years seem to have been driven more by psychology and sociology than technology. Some products, such as Microsoft PowerPoint, Lotus's Freelance Graphics for Windows, and Software Publishing Corp.'s (SPC's) Harvard Graphics for Windows, concentrate on the increasingly collaborative nature of the presentation design and delivery process and emphasize help tools to boost the productivity of the weakest users. Other products, such as Macromedia's Action! for Windows, Gold Disk's Astound for Windows, Asymetrix Corp.'s Compel, and Micrografx Charisma, concentrate on providing tools that let you become a presentation publisher; strong support for audio, video, animation,

and hyperlinks makes it possible to build the presenter into a presentation and ship it off to everyone.

Despite these differences, all presentation software shares a common goal: to generate visual materials that will help you convince, persuade, and inform. With this in mind, we selected presentation packages that met some simple requirements: Each uses a GUI interface (which is essential when working with graphical elements); has built-in data charting; imports or links nontraditional media in the form of .AVI, .FLC, .FLI, and .WAV files; supplies either a standalone player utility or the ability to turn a presentation into an .EXE file for distribution; and has been updated since the last time we covered this topic ("The Sound and the Fury," *PC Magazine*, September 14, 1993).

In addition to the products mentioned above, Alpha Software Corp.'s Bravo! and WordPerfect Presentations for Windows met these criteria. Products such as Stanford Graphics and DeltaGraph Professional for Windows, which we've previously included in this category, lack the runtime capability (see the sidebar "Presentation Alternatives"), while others, including the long-awaited Persuasion 3.0, didn't ship in time to make this story (see the sidebar "Looking Ahead: Impact and Persuasion"). Finally, SoftCraft has repositioned its SoftCraft Presenter as an application-prototyping tool; the product makes a less powerful appearance in the form of Bravo!

Keep in mind that most of the presentation packages these days will saddle you with stiff memory, processor, and hard disk requirements; most of these programs require a fast 386- or 486-based PC with at least 8MB RAM to run comfortably, and they'll eat up about 10MB of disk space in their minimal configurations.

THE COMPANY IT KEEPS

For most users, presentation packages are ancillary products, unlike word processors or spreadsheets. But the software suite phenomenon has vastly changed the marketing and design of presentation



Multimedia:

- **Astound for Windows, Version 1.5**

Traditional:

- **Harvard Graphics 2.0 for Windows**

Rarely does a software product's name accurately describe the package, but Astound for Windows, Version 1.5, deserves its appellation. Gold Disk has combined

great presentation tools with an understanding of the presentations market.

Astound's eye-catching transitions, special effects, and animation capabilities are worthy of distinction, but Gold Disk has also managed to include more traditional tools, such as an outliner and chart capabilities, in a way that will convince even the occasional user to try multimedia.

Other products we looked at feature strong, even dazzling multimedia capabilities. Compel, for instance, shares many of the same multimedia tools with Astound, but it, along with Bravo! and Micrografx

Charisma, lacks a time line, which is a must-have tool if you're creating and managing complicated multimedia events. Action! for Windows, on the other hand, does feature a time line, but where Astound offers an individual time line for each slide, Action! combines the entire presentation on a single time line. With Action!'s approach, you can grab a scroll bar, drag it, and see the entire presentation happen before your eyes, but the complexity, especially for anyone new to multimedia, can be daunting.

In some ways, Astound is almost good enough to be the best *all-around*

software. First, by throwing Freelance Graphics, Microsoft PowerPoint, or WordPerfect Presentations (which will appear in the next version of Perfect Office, expected to ship this fall) in the suite box, Lotus, Microsoft, and WordPerfect/Novell Applications Group essentially eliminate the buying decision for a large number of indifferent users.

Since these users tend to be infrequent presenters and less knowledgeable about graphics in general, the vendors emphasize development of a common user interface with the other apps in the suite as well as tools designed to flatten the relearning curve—tools such as PowerPoint's Cue Cards and Wizards, or Harvard Graphics' Advisor.

Second, integration with the other software packages in the suite and with your coworkers becomes a key concern. For presentation software, this means better tools for tracking, reusing, and routing

presentations (for instance, via support for Notes/FX or through mail-enabled apps), and macros for moving information between word processors and presentation packages. Strong outliners, which can quickly generate slides from word processor-generated outline files, are among the most important tools you'll find in these packages.

Finally, these products reflect a certain conservatism on the part of the vendors. Since the vendors have all adopted a wait-and-see-where-the-market-goes approach to multimedia support (an approach that seems to have paid off so far, thanks to continued multimedia hardware difficulties and price and education barriers), the products pretty much create the same presentations today that they did two years ago: 35-mm slides and 8.5- by 11-inch handouts.

TO BE OR NOT TO BE THERE

Although these products can certainly run electronic slide shows, the shows are simply on-screen versions of old-style visuals. One new aid for the traditional presenter is SPC's \$99 Harvard Spotlight, a stand-

Our Contributors: KATHLEEN CASTER is a staff editor and LORI GRUNIN is a contributing editor of *PC Magazine*. STEVE GILLILAND, DANIEL GROTTA, and SALLY WIENER GROTTA are frequent contributors to *PC Magazine*. LANCE ULANOFF was the associate editor in charge of this story, and JEFF MACE was the project leader.

Desktop Presentations

presentation product, but closer examination reveals shortcomings that would be especially jarring to occasional users. Hard-copy output is almost an afterthought, and you can forget thumbnail views of your presentation with the speakers' notes.

Selecting a clear winner in the more traditional presentation category (those products most likely to be used occasionally) was a bit more difficult, but Harvard Graphics 2.0 for Windows wins. The program does nearly everything right for the occasional user. It offers a great outliner, easy-to-edit slides, and a neat workgroup feature that allows you to run a presentation over a network. Take note, however, that Software Publishing Corp. missed an opportunity when the company didn't make a strategic alliance to get the program included in one of today's popular software suites. For Harvard Graphics to remain competitive, Software Publishing Corp. will have to work diligently to incorporate tighter hooks to popular programs likely to be used in conjunction

with its desktop presentation product.

A notable runner-up in blending learnability and quality presentation graphics is Microsoft PowerPoint. Microsoft Corp. has taken the now-familiar slide-creating metaphor, which uses placeholders such as "click to place title here," and combined it with easy-to-use tools such as Microsoft Graph and WordArt to add information and spice up your presentations.

All the other programs use similar paradigms to help you get up and running. Lotus's Freelance Graphics for Windows, the program that first delivered this style of presentation creation, is beginning to look a little dated in this group. On its own, it still has the same venerable and highly workable "click here" screens, and the latest version has added more SmartMasters and a bit more clip art. Freelance Graphics is the perfect product for Lotus Notes users to purchase. With Freelance Graphics already Notes/FX-enabled, Notes users can add presentation database access to an already good program.

alone utility that allows you to view supporting materials such as speakers' notes and gauges to help you time your presentation on one screen while the audience views just the presentation on another display. Harvard Spotlight also works with

PowerPoint and Freelance Graphics presentations (for more details, see our First Looks review of the product in this issue). Ironically, the non-suite-based Harvard Graphics has the most innovative tool for delivery of presentations across a work-

group: Up to 64 users on a LAN can view your presentation on their workstations while you all converse via conference call. (This capability is also included in Harvard Spotlight.)

What really distinguishes these traditional products from multimedia presentation software packages is that you, the presenter, must still be there to make your point. Products with a sophisticated level of multimedia support, such as Action!, Astound, Compel, and Micrografx Charisma, give you a far greater range of media that help you take the "present" out of presentation; by including voiceovers, video clips, and navigational links, you can create and distribute a personal kiosk for your audience.

Handling more media requires more sophisticated tools. Unfortunately, OLE simply doesn't cut it for multimedia support. With OLE, the presentation application has very little control over the display or timing of OLE objects, and OLE imposes untenable resource overhead as the number of elements you include increases. So these applications need to be able to import a wide variety of sound, animation, and video file formats, in addition to providing some help timing and managing these clips. So far, the best method that has emerged for controlling the synchronization of all these events is the time line, used by Action! and Astound. Time lines give the user a visual,

HIGHLIGHTS

Desktop Presentations

THE ART OF CREATING traditional presentations is now nearly a science. And the "click here to enter title" metaphor has been perfected by everyone from Lotus's Freelance Graphics and Harvard Graphics to Astound for Windows and Compel.

LIVE 3-D DATA GRAPHS are now commonplace. Most products, such as Harvard Graphics, Microsoft PowerPoint, and WordPerfect Presentations, offer tables or spreadsheets to enter data. A double click on the resulting chart usually allows users to reedit the data table.

WHILE THE TRADITIONAL presentation products struggle to add some multimedia functionality to their products or profess to be targeting a market that's not interested in multimedia, multimedia-proficient products such as Action! and Astound for Windows are working to smooth the rough edges of their standard presentation-creation tools.

LONG LAGS BETWEEN upgrades have hurt more than a few products in this roundup. Most notable are Freelance Graphics for Windows and Compel. The former pioneered many of the

creation tools other products employ, and the latter looked cutting-edge—a year and a half ago.

HARVARD GRAPHICS 2.0 for Windows stood out among traditional products by providing strong traditional presentation tools such as Quick Looks, which offer helpful advice on presentation creation by letting users see previews of different layouts and designs. And the package's conferencing feature, which allows up to 64 people to view and comment on a presentation, proved an intriguing attempt at workgroup functionality.

Desktop Presentations

editable representation of the sequence and duration of events.

For all software packages and especially for multimedia presentation packages, intelligent runtime or player file creation is a must. Programs should be able to collect all linked files automatically, as well as to copy, compress, and distribute the files via floppy disks. Similarly, programs should be able to reverse the process on the target system. For situations in which you don't want the recipient fooling around with the presentation or the linked files, the ability to create a complete standalone .EXE file becomes a superior alternative to a player utility.

NOT QUITE THERE

Some continuing problems with all the products, such as poor resource handling, poor 256-color palette control, and multimedia hardware difficulties, may be resolved when Microsoft ships the next version of Windows. Other problems await subsequent versions of the products. While most of the companies seem to have the idea of live preview down cold, many of the helping-hand tools seem to go only halfway. For instance, Harvard Graphics' Design Checker looks at only a few basic characteristics, and PowerPoint's Pick a Look Wizard doesn't really help you pick a look. On-line help systems also still seem woefully incomplete.

In theory, a single package should provide you with the tools necessary for creating any type of presentation you want, with any type of media and output you choose. In practice, we can still distinguish the products by their respective strengths at producing traditional or non-traditional presentations. While not exceptionally difficult to use, products with strong multimedia tools tend to lack the helping hands and advice offered by the traditional products, as well as the presentation database tools offered by the suite-based tools. The traditional packages tend to rely too much on OLE for their multimedia support. The gap is narrowing, however, and by this time next year, when we'll have new versions of Astound and WordPerfect Presentations, among others, we hope to see it disappear altogether.

Suitability to Task:

Desktop Presentations

The desktop presentation market is still fairly segmented into traditional and multimedia packages, but our testing did reveal some movement across market boundaries. Whether you're creating a traditional presentation destined for output to overhead transparencies or a full-blown multimedia presentation that will be projected to a large audience, we tested and rated the features you'll need to get either job done.

To receive an *excellent* rating for Power and Ease in traditional presentations, a package must

have a strong outliner, easy integration with a wide variety of word processor file formats, and rich and well-organized sets of masters and templates.

Products that rate poorly in **multimedia**

integration tend to provide the ability to import AVI, .FLI, and .WAV files via OLE, without offering any mechanism for coordinating them. The time line

SUITABILITY TO TASK		
	Power	Ease of Use
Traditional presentations	POOR	N/A
Multimedia integration	FAIR	EXCELLENT
Presentation guidance	GOOD	GOOD
Workgroup support	EXCELLENT	FAIR
Output	N/A	POOR

metaphor present in some packages elevated Power and Ease scores because of the increased flexibility and control it offered in working with multimedia

For **presentation guidance**, we specifically rate how well each package assists the presenter in four areas: automated presentation-creation guides, design tips for goal-specific presentations, rehearsal support, and the quality of on-line help and written documentation.

Desktop presentation programs should provide users with **workgroup support** in the areas of creation, presentation, and file and information management. As a minimum, programs should be mail-enabled, supporting popular protocols such as VIM and MAPI for routing presentations between users

We rate **output** on these three tasks: printed output, speakers' notes and handout creation, and standalone runtime creation. Desktop presentation packages that receive high ratings are able to output the traditional presentation to both black-and-white and color printers. A package could not receive an *excellent* rating in this category if it did not produce high-quality printed output

Macromedia Inc.

Action! for Windows

BY STEVE GILLILAND

Earlier versions of Macromedia's Action! for Windows contained multimedia features impressive enough to tempt you to use them all at once, but the powerful program's complexity was a sobering shock. With Action! for Windows, Version 3.0, Macromedia has added to the temptation and alleviated the shock by building on its multimedia capabilities while making the program easier to learn.

While this latest version of Action! includes 30 of the now traditional sets of thematically aligned templates (all with animated text), its Timeline can free you from the staid one-slide-leads-to-another format of Action!'s competitors. The Timeline is a powerful graphical facility for controlling the timing of multimedia elements. With the Timeline, everything in your presentation—text, charts, and

tables—can glide continuously through one scene without any slide changes.

Macromedia has added an outliner, right mouse button pop-up menus, and context-sensitive help to remedy some of the ills of earlier Action! versions. A tutorial shortens learning time. The program also supports eight graphical file formats, including Kodak Photo CD and EPS, in 24-bit color. But Action!'s strongest point is its handling of multimedia elements.

SLIDE AND GLIDE

In Action!, you animate objects with user-definable time and motion effects. You can work in scene-to-scene format, using one of the 30 sets of slides (10 slides per set, including formats for title, single or multiple charts, tables, and the like).

When working in the Timeline, you're presented with a set of object bars that resembles a stacked bar chart. The length of each bar represents the time each element is on-screen, measured by a time scale at the top of the screen. Dragging the whole

INTRODUCING THE FUTURE OF GRAPHICS

"Visual Reality is a treasure trove of 3D graphics, rendering tools, models, images, and image manipulation tools...it may well be all you'll ever need. Highly recommended."

Windows Sources - August, 1994

"The CorelDRAW! of 3D software."

Corel Corp. Infoletter! - July, 1994

"Flexible, powerful, and a dream to use."

PC Home - July, 1994

"Extremely user friendly...incredibly addictive"

PC Home - July, 1994

"What you can accomplish with this software is limited only by your imagination."

Circuits - July, 1994

"Visual Reality can do more with 3D Images than anything else you can buy."

Publish - August, 1994

"Visual Reality, you can bet it will soon find its way on many desktops."

PC Magazine - May, 1994

Introducing

VISUAL REALITY

The first product that lets you go beyond your 2D drawing tools. Everything you need to create astonishing 3D imagery and animations is included: 4 Applications, and 2 CDs filled with over 1,500 2D textures and 3D objects. All for \$595.

Call 800-669-7318

For OEM Sales Call 818-593-3500, Ext. 225
For International Sales Fax +44 481-714-573

Visual Software Inc., Woodland Hills, CA 91364
(818) 883-7900 • Fax (818) 593-3737

VISUAL
SOFTWARE



CIRCLE 873 ON READER SERVICE CARD

Image Credits: (top & background) Frederic Bertrand, Compognan, Brussels, Belgium; (middle) Vytas Gaizulis, Apsara Design; (bottom) Steven Andersen, 3D Works, Inc.



• LCD Projection Panels: *Through a Glass Brightly*

Creating great-looking presentation slides is only half the battle; the other half is finding the best way to show them. Options include printing transparencies for use with an overhead projector, getting slides made for a

traditional slide show, or presenting directly from the PC using a presentation monitor or an LCD presentation panel.

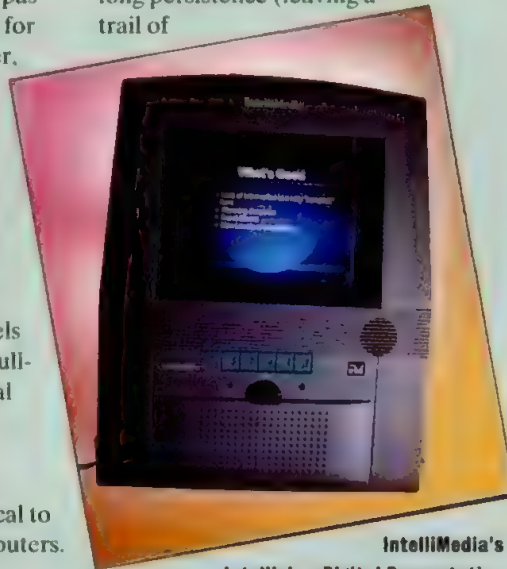
LCD panels are the most expensive solution, with prices ranging from around \$1,500 for a monochrome model to \$2,500 or more for color passive-matrix, and \$4,000 to \$15,000 for color active-matrix units. However, LCD panels give you the most flexibility: They're highly portable—typically only slightly larger and heavier than a notebook PC—and since they don't depend on hard copy output, they make changing your presentation while you're still on the road easy and inexpensive. Many LCD panels are also competent at displaying full-motion video, which can add visual impact to a presentation.

PORTABLE PROJECTION

LCD panels are essentially identical to the LCD screens in portable computers. Instead of having an opaque background, however, the display is sandwiched between two pieces of glass and surrounded by a frame. Screen sizes range from 8.4 to 10.4 inches diagonally; larger panels yield larger projected images at a given distance from the screen.

Monochrome LCD panels are inexpensive, but your presentations will have much more impact if you show them in full color. Color panels use either passive- or active-matrix technology. Though passive-matrix LCD displays are considerably less expensive

than active-matrix LCD panels, they're notorious for producing washed-out colors and having problems with streaking (lines that continue beyond the point where they are supposed to stop), ghosting (faint additional images offset from the expected image), and overly long persistence (leaving a trail of



IntelliMedia's
Intelliview Digital Presentation
System DPS-1.

ghost images behind an object in motion). Most color panels provide VGA (640-by-480) resolution; we managed to find one panel—In Focus's PowerView 950 (\$13,999)—that had a maximum resolution of 1,024-by-768.

We looked at a total of ten passive- and active-matrix color LCD panels from In Focus Systems (800-294-6400, 503-692-4968), IntelliMedia Corp. (800-706-0077, 616-925-3675), nVIEW Corp. (800-736-8439, 804-873-1354), Polaroid

Corp. (800-225-1618), Proxima Corp. (800-447-7694, 619-457-5500), and Sharp Electronics Corp. (800-237-4277). Using the DisplayMate Professional display testing software from Sonera Technologies (800-932-6323, 908-747-6886), we ran a battery of tests to determine, among other things, an LCD's ability to resist ghosting and streaking, maintain equal thicknesses for vertical and horizontal lines, and switch between text and graphics modes without having the image bounce or break up. DisplayMate also includes images for judging display brightness, contrast, and color saturation. Each image in DisplayMate tests one aspect of the display.

The two passive-matrix displays in our group—the \$2,495 Sharp QA-350 and the \$3,299 In Focus PanelBook 450—lived down to passive-matrix technology's reputation. If price is an issue and you only intend to show static color graphics, you may get by using a passive-matrix LCD panel, but don't even consider one for presentations with full-motion video.

Among the active-matrix panels, display quality correlated with price, with less expensive displays showing flaws on more test images than more expensive models showed. The least expensive active-matrix panels we found—the Proxima Ovation 810 LCD Projection Panel (\$4,995) and the In Focus PanelBook 530 (\$5,299)—were both clearly superior to the passive-matrix displays, but both had a limited range of intensity, so that several of the darkest shades of each color tended to merge into each other or into black.

The two most expensive displays—the \$6,795 Sharp QA-1650 and the \$13,999 In Focus PowerView 950—were the only displays without any serious flaws, although even these had a

more limited range of intensity than you would expect from a CRT. The \$6,695 Polaroid Polaview 3000 was close in terms of overall quality but showed one serious flaw: In fine-resolution patterns, it added the same thin, black, flickering lines as the Ovation 810 and In Focus PanelBook 530. The rest of the active-matrix panels, which comprised the nVIEW Z115 (\$5,495), In Focus's LitePro 550 LCD projector (\$8,999), and IntelliMedia's IntelliView Digital Presentation System DPS-1 and DPS-3 models (\$5,995 to \$6,995) delivered perfectly acceptable but not outstanding performance. None of the active-matrix displays showed any problem with streaking or persistence. Only the LitePro 550 showed ghosting at all, but considerably less than the passive-matrix models.

LCD color capabilities are limited, though not as seriously as you might think by looking at specifications. The panels we looked at covered the full range available today, with IntelliMedia's IntelliView DPS-1 offering 185,000 colors at the low end, and the Sharp QA-1650, the Polaroid Polaview 3000, and the Proxima Ovation 810 all offering 16.7 million colors at the high end.

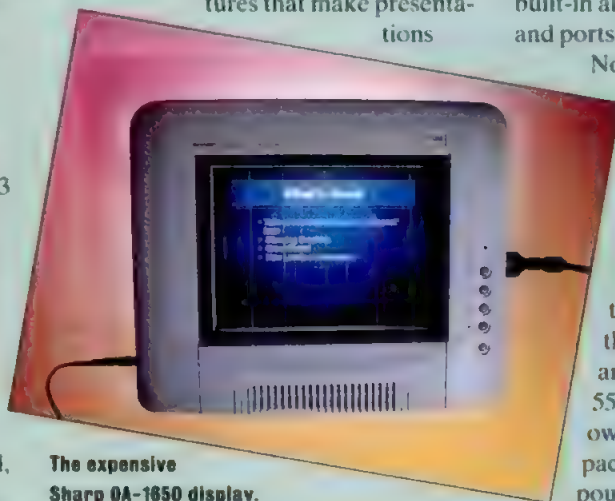
The difference in image quality between 185,000 and 16.7 million colors is nowhere near the order of magnitude that the numbers suggest, however. As a practical matter, 185,000 colors are often indistinguishable from 16.7 million even for photographic images. But Sharp's passive-matrix QA-350 offers only 512 colors, which is another good reason to restrict it to simple graphics.

Except for the Sharp QA-350 and the In Focus PanelBook 450, all of the panels and panel-related products we looked at include television-style video input ports, either standard or as options. In all cases the video supports NTSC, PAL, and SECAM broadcast standards, in both Super VHS and composite video formats, so you can plug in just about any camcorder, videocassette player, or other video device and add television-style motion

video (as opposed to digitized video) to your presentations.

CONVENIENCE MATTERS

In addition to the basics, you'll want to keep an eye out for convenience features that make presentations



The expensive Sharp QA-1650 display.

easier. Most important among these are remote-control capabilities. Any panel should offer a set of controls at least for brightness and color. Other controls you may find, often in the form of on-screen menus, let you clear the screen, adjust the volume (for panels with sound support), and switch between the computer input and TV-style video input.

The best of these remote controls also add control over the presentation. The IntelliView DPS models, for example, include remote pointing devices that let you give commands to software without having to stand at a keyboard. Similarly, Proxima offers an optional \$495 wand pointer to free you from the keyboard and an additional \$295 laser pointer, which, when combined with the wand pointer, lets you move freely around the room.

For full-scale multimedia presentations on the road, you may want to consider panels that offer built-in speakers or other support for sound, such as built-in amplifiers and outputs for external speakers. The IntelliView DPS models come with speakers and built-in Microsoft Sound System-compatible sound devices with CD audio,

MIDI, and .WAV support; the nVIEW Z115 offers a built-in monaural speaker plus stereo output; the Polaroid Polaview 3000 comes with internal stereo speakers but no outputs; and the LitePro 550 has multiple audio inputs, a built-in amplifier with volume control, and ports for external speakers.

Note that LCD panels transmit less light than transparencies, which means you need a bright projector. Most manufacturers recommend an overhead projector with a minimum rating of 4,000 lumens. One way to ensure this minimum is to buy a unit that integrates the projector and LCD panel. The LitePro 550, for example, provides its own light source and panel in a package that weighs just 21.5 pounds and measures 8 by 11.5 by 20 inches. That's heavier than a

display by itself but lighter and far less bulky than carrying a separate display and projector.

Another way to cut down on the number of items you have to carry is to get an LCD panel with an integrated PC. The IntelliView models are the only such products we found for this overview, but others should have similar combinations by the end of the year. With a list price of \$5,995 for a 486SLC/25 version and \$6,995 for a version with a 486SLC/50 CPU and a math coprocessor (both with 4MB RAM and 120MB hard disks), these configurations cost little more than LCD panels without built-in computers.

The best source for LCD panels is generally audiovisual VARs and distributors—the same people you buy your overhead projectors from. These are the sort of products you should test before buying. Be aware that the typical warranty for LCD panels is one year. Finally, when you test each LCD display, get a feel for how easy it is to use the remote. Also, bring one of your own presentations along, so you can see how the panel displays the kinds of slides you actually produce.

—by M. David Stone

Desktop Presentations

bar changes an element's entry and exit times, while extending or shortening a bar changes the length of time the element is on-screen. Unlike Astound, which has one time line per slide, Action!'s Timeline shows the entire presentation as one continuous event. Those familiar with Macromedia's multimedia authoring product, Director, will recognize Action!'s time line metaphor. Traditional presentation users moving over to multimedia may still find Action!'s Timeline a bit too complicated.

For more precision than the mouse and object bars afford, you use the Edit Object Options command for dialog box access to a series of folderlike tabs that contain a combination of various visual, sound, and timing settings for an object. For example, here you can edit text animation on one screen and add a sound element to enhance the title's entrance on another. In addition, you can use the motion dialog to specify the movement and duration on screen of almost any object, including the playing time of a video clip. Element timing is controlled—to one-tenth of a second—from yet another view.

For a step-by-step preview of your presentation, you can reduce the size of the Timeline screen to see what's happening and use the mouse to drag the actual playback head (a vertical marker that moves across the element bars) through each presentation scene. As you do, the scene elements appear on-screen just as they will when the final presentation is playing.

Action! handles multiple objects without much distortion. On our 486/66 test system, Action! had no trouble simultaneously playing a .WAV file and an .AVI clip and smoothly moving five bitmapped objects. The program did have some trouble with precision timing of separate audio and video objects, sometimes starting an audio clip somewhat late when several multimedia elements were closely packed. You solve this problem by using the Edit Object Options command to bring in the audio clip with a visual object on-screen at the same time.

Version 3.0 of Action! has some important new features. The outliner

arranges and deletes scenes, transfers text directly to the scene as you fill in outline items, lets you collapse and expand the outline, and promotes and demotes textual items. Action! still doesn't directly import text, however. Instead, it uses the Paste and Paste Special commands to



Macromedia's Action! for Windows features the fully editable Timeline feature to control all the elements of your multimedia presentation.

bring in text in outline format.

Though Action! doesn't directly import files from other presentation programs, it will import slides in .WMF format. If you have the appropriate hardware, it will export files to NTSC video.

In spite of some puzzling omissions,

such as the inability to rotate objects or put an arrow at the end of a line, Action! now has more of the tools necessary to handle traditional presentations intelligently. What it lacks in text-import abilities it makes up for in ease, thanks to the new tutorial and context-sensitive help. And for users who need high-quality multimedia effects, Action!'s Timeline provides all the power you'll need.

Gold Disk Inc.

EDITORS' CHOICE Astound for Windows

BY LORI GRUNIN

When it's time to give an electronic presentation, Astound outshines the rest in terms of pizzazz and performance. This \$399 package lets novice users create simple stand-alone or interactive presentations, and at the same time offers a powerful set of tools for the more advanced presentation developer. The product's approach to traditional hard copy-based presentations is less automated and robust than much of the competition's, but it does the job.

Astound follows the operational metaphor we've become used to in presentation products: You choose a template, then double-click in placeholders to enter text or data. As with Action! and Compel, each object or group of objects on the slide can have transition, timing, path-animation, and action properties. Each template comes with default behaviors for the master objects, such as title and body-text placeholders, as well as background graphics. As a result, creating an electronic presentation with automatic slide builds and consistent transition effects is as easy as creating a static presentation with any other product.

OBJECTS IN MOTION

The key to Astound's strength as a multimedia presentation tool is its exceptionally intelligent media handling and easy-to-understand animation and synchronization tools. When you add external elements, such as sounds, animations, and videos, Astound loads the elements and makes them accessible for all slides; you can then purge any unused elements from the presentation with a single command. This proves a good way to minimize resource overhead when you use a lot of repeated

▶ FACT FILE

Action! for Windows, Version 3.0

List price: \$199, Action!, CD-ROM edition, \$299
Requires: 386/25-based PC or better, 4MB RAM, DOS 3.1 or later, Microsoft Windows 3.1 or later **In short:** Action! for Windows is a good choice if you need to create stunning multimedia-intensive presentations. Its new context-sensitive help and outliner aid its handling of traditional slide shows far better than before.

Macromedia Inc., 600 Townsend St., San Francisco, CA 94103, 415-252-2000, fax, 415-626-0554

\$35 on reader service card

SUITABILITY TO TASK

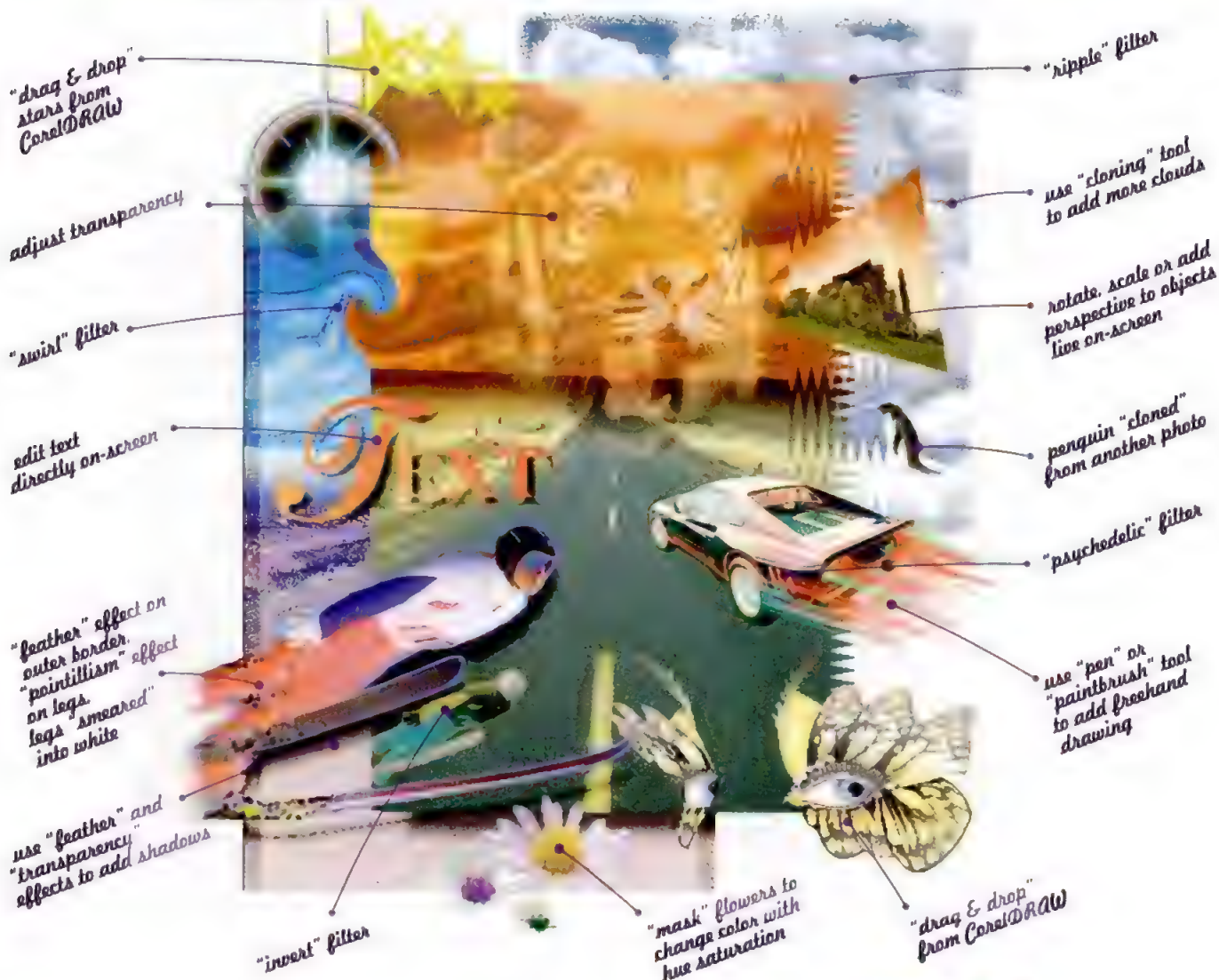
	Power	Ease of Use
Traditional presentations	FAIR	GOOD
Multimedia integration	EXCELLENT	GOOD
Presentation guidance	FAIR	GOOD
Workgroup support	N/A	N/A
Output	FAIR	GOOD

The new leader in photo-editing

COREL PHOTO-PAINT 5

The Best in Photo-Editing and Bitmap Creation

Corel PHOTO-PAINT 5 includes a powerful color management system and all the tools you will need to paint, edit and retouch your images. With dynamic special effects such as mesh warp, swirl, pinch and 3D perspectives, and the ability to import or scan photos, creating your own design is easy with Corel PHOTO-PAINT 5.



Productivity!

- Load and edit partial images
- Unlimited file size
- Accurate color calibration system
- Corel MOSAIC
- Corel CAPTURE

Creativity!

- Create your own palettes and brushes
- Amazing and unique special effects
- Precise photo-retouching
- 29 artistic filters

Easy to Use!

- Includes 100 ready-to-use Corel Professional Photos
- 10,000 clipart images
- 100 TrueType fonts
- Intuitive user interface
- Comprehensive on-line help



CD-ROM version

\$199

TigerDirect

1-800-CD-TIGER
1-800-238-4437

* Suggested List Price in US\$ plus applicable taxes. Dealer may sell for less.



ext 20
1-613-728-3733

Desktop Presentations

elements. An Enhance Color mode will create an optimized subpalette across several objects to minimize palette-switching problems caused by video clips or bitmaps in 256-color mode.

Like Action!, Astound gives you a time line (one for each slide) for controlling events, including the individual motions of elements within a group, and supplies some automatic ways to distribute events over a specified period of time. Astound's chart animation is especially powerful: You can control the movement of any chart element, right down to the individual faces of a 3-D graph. A built-in sound editor also lets you edit .WAV files; looping and fading controls are also provided.

BACK TO BASICS

Astound gives you a lot of power, but it also has some disappointing holes, mostly in those areas where more traditional packages excel. The program's generally well designed interface allows for quick operation, but as with many of these products, it could stand some fine tuning.

Overall, Astound handles entering and formatting text very well; most formatting options are available from the ribbon bar at the top of the screen. Unfortunately, the program's outliner needs a bit of beefing up. Imported text automatically creates a new slide and new text boxes (rather than filling in existing placeholders).

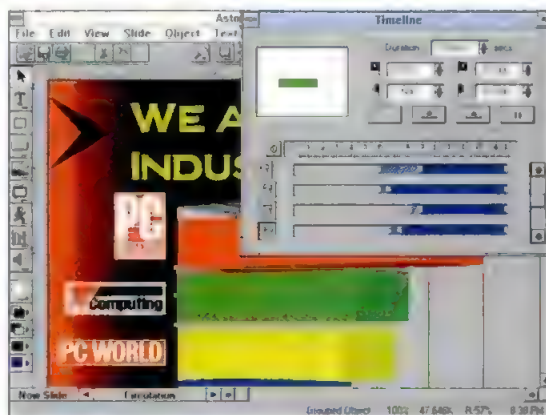
Charting and data handling also present a somewhat mixed bag. You can create a reasonable selection of charts, including pictographs, and reformat almost every element. The data sheet is extremely basic, though; you must cut and paste to get your data into the proper arrangement.

Finally, while the program can import a reasonable selection of graphics file formats, it doesn't have much in the way of drawing tools—just a set of predefined shapes. Astound does have a nice set of fills, however, including multicolor gradients.

Once you get the hang of it, creating custom master templates is quite easy. And while Astound does have an edit master mode, you can turn any slide into a template with a single command.

GETTING THE WORD OUT

Astound's runtime creation is very strong. You can either save a presentation as a self-contained but still editable player file, with all the linked elements included, or save it as a self-running executable that can be automatically spread across multiple floppy disks. The latter procedure, which Gold Disk has greatly improved in



Astound's exceptionally strong chart animation includes the ability to control transitions among most elements.

Version 1.5, works quite intelligently. Astound compresses your presentation when you copy it to floppy disk and creates an executable that will decompress the information when you transfer it to hard disk.

▶ FACT FILE

Astound for Windows, Version 1.5

List price: \$399 **Requires:** 386-based PC or better, 4MB RAM, 6MB hard disk space, DOS 3.1, Microsoft Windows 3.1 or later **In short:** Astound for Windows is an excellent choice for multimedia-intensive presentations that also stands up reasonably well to creating traditional hard copy-based presentations.

Gold Disk Inc., 3350 Scott Blvd., Building 14, Santa Clara, CA 95054, 800-982-9888, 408-982-0200; fax, 408-982-0298

536 on reader service card

SUITABILITY TO TASK

	Power	Ease of Use
Traditional presentations	GOOD	GOOD
Multimedia integration	EXCELLENT	EXCELLENT
Presentation guidance	GOOD	FAIR
Workgroup support	N/A	N/A
Output	GOOD	EXCELLENT

Hard copy output doesn't fare as well. The print quality is fine, but you can only select from preset page layouts, the speakers' notes don't include slide thumbnails, and all service bureau slide output must be handled as PostScript files.

If Gold Disk remedied some of these problems, Astound would be a great all-around product. As it is, it's a great tool for electronic presentations and a satisfactory one for traditional hard copy-based ones.

Alpha Software Corp.

● Bravo!

BY KATHLEEN CASTER

Tools may not make the artist, but Alpha Software Corp.'s Bravo!, Version 2.0, gives business users ample tools with which to hammer out a handsome, effective presentation in minutes. The \$79 package's DDE and OLE 1.0 support, along with good charting and illustration tools, lets you slap a presentation together quickly, while still applying a bit of creative flair.

Bravo! has a simple, sometimes awkward interface and limited multimedia capabilities despite its origins: It's a repackaged version of SoftCraft Presenter, a \$595 high-level multimedia powerhouse from SoftCraft Inc. designed primarily for developers.

Bravo!'s appeal lies in its price and its simplicity. It is easy to install and set up and comes with a tutorial. The Bravo! documentation, although skimpy in places and poorly indexed, includes tips on creating and designing your presentations.

BEGIN THE BEGIN

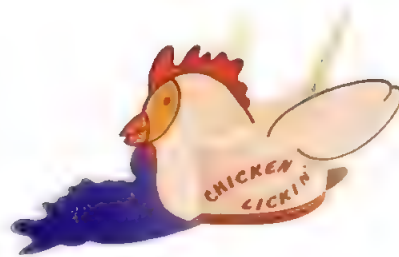
You begin your work in Bravo! by selecting a design from a gallery of slides. Next, you select from a variety of templates, including Background, Word Chart, Graph, and Title. There's a pitfall in the template process: After choosing or modifying a template, you naturally start to add elements such as text or graphs. But when you're done making global changes, you need to exit the template mode by changing views, since there is no defined exit from global edit mode. Otherwise, subsequent changes will also become part of the template.

You can make each presentation ele-

Your roommate helped you with your term paper.



Uncle Seymour got you your first job.



Why not get some real advice on your next presentation?



Introducing Harvard Graphics 3.0.

Want some advice from an expert to make your presentations more effective? 🐔 There's one inside every box of new Harvard Graphics 3.0. With this new version, Harvard Graphics takes its most popular feature—the Advisor—and carries it forward a quantum leap. 🐔 The new Advisor System puts thousands of hours of presentation savvy to work for you, automatically. Suddenly, the guesswork and gruntwork of putting together a presentation are ancient history. You get Design Tips to help you choose the right colors and layouts. Quick Advice to tell you what kind of chart will best dramatize your data. And the Design Checker to review and improve on your whole presentation, just like a spellchecker. 🐔 Want to make it really easy on yourself? Just use one of the enclosed Quick Presentations—a collection of polished presentations you can instantly customize for your own use. 🐔 But all this is just scratching the surface. New Harvard Graphics 3.0 contains all kinds of new features. And it works with all your other Windows applications. Upgrading is a no-brainer. 🐔 So, go ahead, just pick up the phone. 🐔

Upgrade For Only \$99.*

Want more information? Call 1-800-336-8360, x 376.



* Upgrade eligibility requires that you own a licensed copy of Harvard Graphics or competitive presentation software. Other conditions apply; call for details. Harvard Graphics and the Software Publishing Corporation logo are registered trademarks of Software Publishing Corporation. Harvard Graphics is a product of Software Publishing Corporation and has no connection with Harvard University. SPC acknowledges all trademarks and the rights of trademarks referred herein. © 1994 Software Publishing Corporation. All rights reserved.

Computers

CompuDyne 4/210 DX250 #18805 ... 1,149.99
CompuDyne DX2/66 MiniTower B/420 1,599.97
#181814
CompuDyne Pentium MM MT #18583 ... 2,199.99
CompuDyne DX2/66 Desktop 4/420 ... 1,299.99
#18371



**Guaranteed
Low Prices**

CompuDyne 4/420 DX2/250 #18832 1,299.99
Compaq Presario 860 CDS SX2/66 MM MT
#322511 ... 1,896.97
CompuDyne SX33 4/210 #312951 ... 899.99
Pack Bell P60 Pentium MT B/420 MM ... 2,199.99
#487850
Pack Bell P/90MHz Pentium B/810 ... 2,699.99
#483355
Pack Bell DX2/66 MM MT B/720 ... 1,899.99
#477825
Pionex P60 Pentium MM MT B/425 ... 1,999.99
#497983

Business Systems

Apple-Power Macs ... Call
AST-Ascendia, Bravo, Prentiss ... Call
Compaq-Prolinea, Deskpro, Elite, Prolinea,
Prosignia ... Call
IBM-PS2, Valuepoint, Thinkpad ... Call
Toshiba, 4000 Series ... Call
Dell Dimension ... Call

Notebooks

Compaq Aero 4x133c 4/170 MB ... 1,999.99
#297164
Epson AM 500c 45LC 2/50 4/260 ... 1,899.99
#278174
Epson AM 486 SLC 2/50 4/260 ... 1,499.99
#489190
NEC Versa DX2/40EC 4/250 #260381 ... 3,879.99
NEC Versa SL-33 4/210 #475042 ... 2,449.99
TI TM4000E Win DX2/50C 4/200 ... 3,779.99
#820554
TI TM4000E Win DX4/75 4/340 ... 3,999.99
#295391
Toshiba T1910SL/33 4/200 #297681 ... 1,639.99
Toshiba T1910CS SX/33 4/200 ... 2,229.99
#297672
Toshiba T1960CS #421813 ... 2,499.99
Toshiba T1960CT #421804 ... 3,249.99
Toshiba T2400CS4/250 #490445 ... 3,199.99

Monitors

Compaq 14" SYGA 28 NI 800 ES ... 396.97
#247575
CompuDyne .39 14" mm dp #976741 ... 219.99
CompuDyne 14" 28 NI #289481 ... 279.99
CompuDyne 15" 28NI Fs #289490 ... 359.99
IBM 14" 28 NI #235034 ... 399.97
NEC 14" 2V 28W5 #414692 ... 349.99

NEC 3V ES, 15" 28 mm dp #216135 ... 479.99
Nokia 15" 28 NI FS Trinitron #475015 ... 569.99
Nokia 17" 25 NI Trinitron 1280 #474944 989.99
Nokia 17" 25 NI Trinitron 1600 ... 1,169.99
#474953

Printers

Canon BJ10SX Printer #257351 ... 249.99
Canon BJ200E #274103 ... \$289.97

Cards

Networking

3Com Etherlink III 10BaseT #530580 ... 129.99
Artisoft LANtastic 6.0 Software 1 User ... 89.99
#301491
Focus AAUI Transceiver 10 BT #265741 ... 49.99
GVC Coax 16 Bit Eth Adap. ... 59.99
Software Selectable #286121

Modems

Hoyes Accura 288 V.f.c+fax #279335 ... 299.99
Intel 14.4/14.4 Fax/Data PCMCIA ... 239.99
#246291
Megahertz Xjack 14.4 w/ Fax PCMCIA ... 249.99
#947981
Prax Periph 14.4/14.4 Mini-Tower II ... 139.99
#323282
US Robotics 14.4 Mac-II-Fax #525872 ... 169.99

US Robotics Sportster 14.4 Int w/ Fax ... 129.99
#525863
Digicom 14.4+Fax w/19.2 upgrade ... 79.99
#294773



**Custom
Configuration**

Multimedia

Speakers

Addison Technology Spkr #947743 ... 17.99
Altec ACS-300.1 #286722 ... 299.99
AR Powered Partner 22 #948292 ... 89.99
Jensen JPS-45 #477654 ... 149.99
Labtec CS-800 #494645 ... 42.99

Video

Reveal Radio Card #494753 ... 49.99
T Vator VGA to TV Adapter #251184 ... 299.99
Videologic 928 Movie ISA #308170 ... 299.99

Audio

Gravis Ultrasound Max Waveable ... 199.99
#435141
MediaVision Premium 3D Mod ... 159.99
#435163
Sound Blaster 32 AWE #302174 ... 299.99
Sound Blaster 16 Value #38472 ... 99.99

Kits/Drives

Apple Multimedia Kit #354794 ... 449.99
CompuDyne 2x CD-ROM drive ... 129.99
#308900
NEC Multiscan 3XE #232852 ... 399.99
Creative Labs Gameblaster CD16 ... 399.99
#295371
Reveal Wave Kit w/35 Titles #494762 ... 599.99
Sony Multimedia Kit #335961 ... 299.99
Tasc Super Quad 4X #477601 ... 429.99

Accessories

APC400 Backup UPS #833192 ... 179.99
Chicony 101 Key Keyboard #45141 ... 19.99
HP Hi-capacity Inkjet Cartridge #481661 ... 24.99
Microsoft Serial Mouse 2.0 #763463 ... 59.99
O'Sullivan Workcenter #887945 ... 89.99
100 3 1/2" HDI IBM Diskettes ... 39.00
After \$10 Mail-in Rebate #318434 ... 29.00

Storage

Conner 420 MB Hard Drive #296893 ... Call
Conner 250 MB Tape Drive #23261 ... 129.99
Maxtor 345 MB Hard Drive #95721 ... Call
Maxtor 546 MB Hard Drive #301082 ... Call

Software/CD-Rom

Cinemania '94 #223760 ... 48.99
Critical Path #254584 ... 47.99

Increase your buying power.

Now, you can take advantage of the buying power of America's largest computer superstore, backed by the strength of 78 stores nationwide. Nobody offers a bigger selection or more name brands than CompUSA DirectSM. And we pass that buying power along to you—with guaranteed low prices on everything we sell.* You won't get all this from any other direct company. So make the right call, to 1-800-CompUSA.

Canon BJC-600Color #214404 ... \$569.97
Citizen Notebook Printer II #245390 ... 299.99
Epson ActionLaser 1500 #945482 ... Call
Epson Color Stylus #359793 ... Call
HP LaserJet 4+ #226044 ... Call
HP LaserJet 4L #945741 ... 599.99
After \$50 Mail-in rebate
HP LaserJet 4P #226044 ... Call
Okidata OL400E Laser Printer #214235 ... Call
Sharp JX 9400 #324394 ... 489.99
Tektrex Phaser 220E #316045 ... 3,994.99

GVC Pocket ETH TP & BNC Adapter 10 BT 159.99
#279460
GVC PCMCIA Combo Eth. Adap. TP & BNC 189.99
#501814
Novell Personal NetWare 3.5* #267311 ... 69.99
SMC Eth 16 Combo Adapter #42192 ... 149.99

Graphics Cards

Diamond Stealth 64 VLB 2MB #477574 ... 399.99
STB Lightspeed VLB #237322 ... 159.99



*If you find a lower price in the current issue of this magazine we'll beat it. Guaranteed. Offer good on all new in the box products of the same brand and model number that are available in stock from any other authorized mail order competitor. It does not apply to competitors' one of a kind or other limited quantity offers or when a bonus or free offer is included in the purchase. CompUSA Direct prices are available through mail order only. Prices and specifications are subject to change without notice. We reserve the right to limit quantities. Technical support available through your nearest CompUSA Superstore Technical Service Center. On site service is available within the continental U.S. only.

ESPN Sport Shorts #335060	21.99
Megatrux #223225	37.99
Myst #280780	47.99
Outpost #289002	37.99
Print Shop Deluxe Ensemble #499525	79.99
Star Wars Rebel Assault #254531	44.99
StarMaterial #316604	15.99
Taxi #235993	49.99
The 7th Guest #331322	42.99

Software/DOS

Communications

BitFax/Bitcom- #181862	29.99
CompoServe Membership Kit #170451	24.99
LapLink V #163682	119.99
Microcom Carbon Copy Plus 6.1 #183394	149.99
PC Anywhere 5.0 #296753	129.99
Procomm Plus V 2.01 #169114	99.99
Prology Start Up Kit #181555	16.99

Upgrades

Dbase for DOS 5.0 Upgd #360073	149.99
--------------------------------	--------

Business

BizPlanBuilder- #141251	89.99
Employee Manual Maker DOS/Win #169444	99.99
Managing Your Money 10.0 #214703	28.99
One Write Plus Accounting 4.0 #264840	49.99
Power Builder #280664	249.99



Graphics & Design

Animation Studio #393620	89.99
Home 2.0 #239325	24.99
Home Series Deck 2.0 #239334	24.99
Home Series Kitchen/Bathroom 2.0 #239314	24.99
Landscape 2.0 #225232	24.99
Print Shop Deluxe #499561	49.99
Print Shop Deluxe CD Ensemble #499525	54.99

Programming

Borland C++ 4.0 Upgrade CD-ROM #259393	197.99
Borland Turbo C++ Visual Edition #163042	79.99
Turbo C++ 3.0 #160812	79.99
Turbo Pascal 7.0 #160935	117.99

Utilities

386Max 7.0 #595163	49.99
Caché 86 5.0 Win/DOS #104632	41.99
Check It Pro Set #164100	94.99
Morton Utilities 8.0 #294835	119.99
QEMM 7.03 #166215	69.99

Spirin III 3.1 #164020	89.99
Xtreme Gold 3.0 #206490	99.99

Entertainment

1942 Pacific Air War #288804	49.99
Alone In The Dark 2 #288791	34.99
Corridor 7 #222073	27.99
Comanche Max Overkill+Mission 1 #239303	47.99
Elder Scrolls: Arena #250383	39.99
F-14 Fleet Defender/DOS #280715	49.99
The Fighter #294522	44.99
Harpoon II #256691	42.99
Indy Car Racing #251435	42.99
Links 386 Pro #388164	39.99
Links Castle Pine #298511	18.99
Master of Orion #212302	42.99
Microsoft Flight Simulator 5.0 #159633	39.99
Mortal Kombat #234801	34.99
Pinball 2000 #275482	49.99
SimCity 2000 Scenario #293444	12.99
SSN-21 Seawolf #232204	42.99
Star Trek: Judgment Rites #23540	37.99
X-Wing #331022	39.99

Software/OS/2

Upgrades

IBM OS/2 2.1 Upgrade #561902	Call
Lotus SmartSuite OS/2 Upgrade #211653	279.99

Business

Footprint Works OS/2 v #277721	89.99
*BM OS/2 for Windows #229292	Call

Communications

fax/PM OS/2 #277710	99.99
Jorden ComPress #277783	59.99

Utilities

Jackhammer For OS/2 2.1 #277732	59.99
JPU Monitor Plus OS/2 #277674	79.99
Hyperaccess/5 DOS #05/2 #277685	139.99
Performance 2.1 Plus OS/2 #277743	24.99
Vipout OS/2 #277663	39.99

Programming

CA Realizer 2.0-Win/OS/2 #262483	77.99
----------------------------------	-------



Software/Windows

Upgrades

Dbase For Windows 5.0 Upgd #366104	199.99
Lotus SmartSuite 3.0 #501574	279.99
MS Access 2.0/Win. Upgrade #297974	118.99
MS Office 4.2 Upgrade #281885	248.99

MS Word 6.0 Competitive #226240	128.99
PC Tools 2.0 Upgrade #285815	49.99
Stacker 4.0 Upgrade #284991	49.99



Communications

Carbon Copy 2.5 #477723	139.99
Close Up 5.0 Host/Remote #218721	139.99
Eclipse Fax w/OCR #164224	39.99
Internet Kit/Win #336434	39.99
Procomm Plus 2.0 #487431	139.99
Smartcom for Windows #164832	49.99
Winfax Pro 4.0 #294492	77.99

Database

Access 2.0 #297941	329.99
Approach 3.0 #358094	99.99
Avery Label Pro Lazer #170291	48.99
Dbase For Windows 5.0 #366115	359.99
My Advanced Mail List #251561	39.99
PowerMaker 3.0 #221951	189.99
PowerViewer 3.0 #221940	89.99



Business

mi Pro 3.01 #118642	299.99
Charles Givens Money Guide #292070	39.99
Easy Accounting #264624	99.99
Inside Daily Planner #225170	29.99
Leach Power Translator #268944	109.99
German Power Translator #268822	109.99
IS Money 3.0 #281954	29.99
IS Word 6.0 #226251	299.99
IS Works 3.0 #238745	79.99
LYOB 4.0 #294141	59.99
enchron Accounting #474775	119.99
sales & Marketing Success #143883	59.99

SmartSuite 3.0 #499832	499.99
Spanish Power Translator #268833	109.99
Success, Inc #143874	89.99
Windows On Wall St V 2.1 #263781	99.99

Graphics & Design

Aldus PageMaker 5.0 #540991	599.99
Astound #263883	128.99
Corel Draw 3 to 5 Upgrade CD #363555	319.99
Corel Draw 3 to 5 Upgrade 3.5 #363582	419.99
Corel Draw 4 to 5 Upgrade CD #363564	219.99
Corel Draw 4 to 5 Upgrade 3.5 #363591	259.99
Corel Draw 5 CD #363522	519.99
Corel Draw 5 3.5 #363544	599.99
Floorplan Plus #130152	34.99
Morph 1.5 #274054	69.99
MS Publisher 2.0 #153121	99.99
Windows Draw #135954	59.99

Education

Bodyworks/Win #266884	44.99
Kid CAD #231803	29.99
MathMaster: Search for Spot #241553	35.99
Spanish Assistant #223840	59.99

Entertainment

Best of Entertainment Pack #313565	19.99
Bicycle Budget Software #283231	12.99
Microsoft Windows Arcade #159642	27.99

Utilities

CD Essentials/Win #293630	29.99
Clickbooks 1.1 #314613	51.99

Corel SCSI 2 #259592	97.99
Dashboard 2.0 #166652	49.99
Direct Access 1.0/Win #272112	71.99
Disney Screen Saver #284714	29.99
Icon Hunt-it Too #284902	19.99
MacDisk 1.0 Win/DOS #267273	54.99
MS Win/Workgrps 3.11 Add On #238763	49.99
Norton Antivirus 3.0 #224501	99.99
Norton Desktop 3.0 #223273	129.99
Print Cache 3.1/Win #163913	49.99
Screen Dreams Golf Digest #281442	21.99
Stacker 4.0 Win/DOS #285004	93.99
Star Trek:Screen Saver #162745	29.99
Uninstall 2.0 #251743	49.99
Viruscon For Windows 1.5 #283854	89.99
Windowmagic 3.0 #294334	41.99
Ultimate Utilities Suite #323180	94.99
Xtreme 2.0 #207742	69.99



Ordering is fast and easy!

Order 24 hours a day, 7 days a week. CompUSA is always ready to take your order... and get it to you as quickly and conveniently as possible.

Call for a free catalog.

To place an order or for a free catalog listing over 5000 computer products call 1-800-COMP USA.

Standard Delivery.

For a minimal fee, we'll ship your order anywhere in the world within 5 to 7 working days.**

Next-day Delivery.

We'll be happy to ship your order for delivery by the following day (except Sundays). Additional delivery charges apply.

Fax orders welcome!

You can fax your order anytime! Fax 1-800-FAX-2212.

International Orders: 1-214-888-5770

International Fax: 1-214-888-5760

Government Sales: 1-800-862-3088



COMP USA DIRECT
1-800-COMP USA
2 6 6 7 8 7 2

• Presentation Alternatives

By John Moore

Sometimes the road less traveled is the best path. Your presentation needs may lie outside what's offered by the products in the main roundup. If this is the case, then one of the packages discussed here could be right for you.

The \$495 Stanford Graphics, from Visual Numerics (713-784-3131), is a good choice if you need to create presentations with lots of attractive charts and graphs. You can create a variety of business, statistical, and technical charts with several 3-D variations.

While charting and graphing are Stanford Graphics' strong points, the product handles traditional slide shows with aplomb as well. Version 3.0, which should be available by the time you read this, includes text rotation, enhanced line styles, and 42 new Style-Masters to get you up and running. It also now imports EPS files, as well as AutoCAD .DXF and Harvard Graphics .CHT files. And to make things easy for you, Stanford Graphics' Quick Start feature gives you the choice of creating a presentation, graph, or bullet chart, or of going through the tutorial as soon as you launch the program. The Windows NT version is available for \$695 (\$199 upgrade from the standard Version 2.1).

CHART MASTER

If you need to create presentations that consist solely of charts, then the \$195 DeltaGraph Professional for Windows, Version 2.04, from DeltaPoint (408-648-4000) is worth a look. It offers a gallery of more than 40 chart types, including several 3-D options. DeltaGraph Professional also helps you as you create your presentation. The Chart Advisor helps you decide which chart—either technical or business—is appropriate for the data or audience you've selected.

Don't look for sophistication here.

Although there are several types of 3-D charts to choose from, you can't animate your charts or add any other effects other than transitions among slides. DeltaGraph Professional is simply for basic, chart-based presentations.



Stanford Graphics' Quick Start feature gives you several options upon launching.



Super Show & Tell's Media selection icon provides easy access to multimedia files.

SHOW & TELL

You may want to create a multimedia presentation but don't want to learn the film-editing techniques associated with a time line. The \$199 Super Show & Tell (SST), Version 1.5, from Ask Me Multimedia (612-531-0603), includes the new AutoRecord feature, which allows you to add anything to the Action Playlist automatically, including moving text. More importantly, the Resource Preview dialog lets you preview any multimedia file before importing it into your presentation.

Like traditional presentation pack-

ages, SST includes master slides and templates, slide gradients, patterns, and fill colors. But it has no controls for changing the timing of your slide shows, although you can adjust the length of time that each element is on-screen. Also, video clips tend to look rather messy.

The \$199.95 Curtain Call, Version 2.0, from Zuma Group (602-246-4238), is a presentation graphics and paint program in one package. You can assemble multimedia events in the Script Editor and create runtime versions of your slide shows. Most impressively, Curtain Call allows you to develop MCI (Media Control Interface) scripts to control multimedia hardware. Curtain Call will even let you create your own images to use in a presentation.

The \$199 Q-Media for Windows, Version 2.0, from Q-Media Software Corp. (604-879-1190), straddles the fence between presentation package and multimedia authoring software. Its best use, however, is for adding multimedia elements to your traditional presentations.

Via OLE 2.0, you can link presentation files from Aldus Persuasion, Freelance Graphics, Harvard Graphics, and Microsoft PowerPoint to Q-Media and add multimedia elements. Like Curtain Call, Q-Media also allows you to assign MCI commands to hardware devices for more sophisticated multimedia control.

Slides in Q-Media are called *scenes*. Like traditional presentation software, Q-Media has an outliner in which you can arrange your slide show. And like multimedia presentation packages, Q-Media features a time line for syncing your multimedia events.

These products are certainly not your garden-variety presentation packages. But if your needs fall out of the typical presentation realm, one of these may be worth a look. □

ment an overlay object and apply transitions and delay times to each. Bravo! offers several navigating tools, including the slide sorter and the outline view.

For adding and altering text, you can access a variety of fonts. Bravo!'s ample text features include kerning, rotating, and stretching. Moreover, Bravo! doesn't disappoint when you double-click on the text in a slide: Two mouse clicks automatically bring up the text-editing ribbon.

PICTURE THIS

Bravo!'s variety of illustration tools go well beyond typical items such as circle- and polygon-drawing tools. You can group and align objects, as well as specify the scale and visibility of objects, the color and horizontal and vertical depth of shadows, the degree of arcs, and the width and color of lines. The package also allows you to apply gradient and solid fills to drawings and graphs, although it does not allow you to animate any of these.

Bravo! features graphical and text templates called Smart DataPictures. These allow you, for example, to import an arrow filled with editable text and the arrow will automatically scale to fit the text.

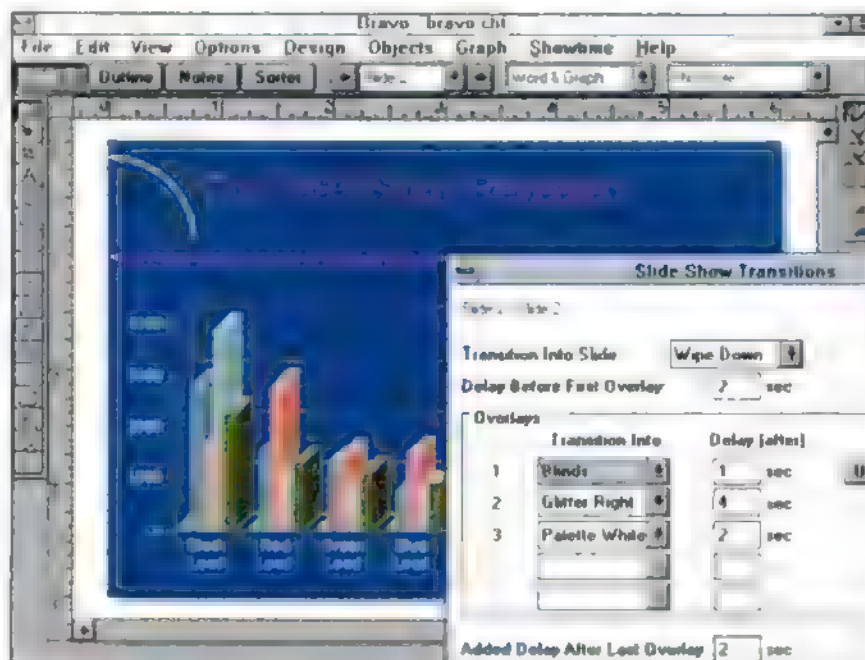
Bravo!'s charting features are numerous and useful. There's a large gallery of graph types, and you can select and change different graph elements with ease, allowing you to select the graph's legend and apply the usual array of text options to it. You can also select an individual bar on a bar chart and change its color to highlight its importance. You have the option of either inputting numbers on Bravo!'s data sheet or importing an existing Lotus 1-2-3, Microsoft Excel, Paradox, Quattro Pro, or Symphony spreadsheet file.

In our testing, the first line of an imported Excel spreadsheet was corrupted. The Windows Clipboard provided a quick workaround, but Bravo!'s support for DDE and OLE works just as well, allowing you to establish a link to your spreadsheet file and bring in the correct data in a snap.

TWO-WAY STREET

Bravo!'s two-way OLE support lets you bring in and establish links to various

Windows applications and to the Windows Media Player, through which you import .WAV files. You import .FLC files



Bravo! offers several transition effects, all of which can be applied to different overlay objects on each slide and to the slides themselves.

via the Media Player or the standard Import Picture option.

What Bravo! lacks, however, are built-in tools for customizing multimedia files. If you would like to crop an .FLC file or shorten a sound file, you are forced to use a third-party package. Bravo! does feature the expected variety of output options, including handouts and speakers' notes. Although the runtime player in the current version doesn't support sound

files, this capability is expected to be in the next release, due to ship in early 1995. The next version of Bravo! will also include more designs and transitional effects, Wizards, a built-in spell-checker, and improved usability features.

Even without the promised enhancements, Alpha's Bravo! is a good entry-level package that lets you create relatively simple presentations in a small amount of time. Though usability quirks along with limited animation effects and multimedia tools diminish Bravo!'s value a bit, a wide range of text, charting, and illustration flourishes enhance its value.

Asymetrix Corp.

● Compel

BY DANIEL GROTTA AND
SALLY WIENER GROTTA

Trying to satisfy everyone can often result in disaster. While Asymetrix Corp.'s Compel, Version 1.0a, is no train collision, the attempt to combine traditional tools with powerful but out-of-date multimedia presentation tools in this \$295 product has at least resulted in a derailment.

Compel's bundled CD-ROM contains more than 100MB of multimedia clips to spice up presentations, and the package's rich offering of sample master templates are divided into different subdirectories, depending on your intended display medium. Creating custom templates is quite simple, and you can use different templates within a single presentation.

Compel's major drawback is its lack of an outliner, which means text must be typed directly onto the slides. Nor can text be imported from any word processor except through Windows cut-and-paste. Even the ASCII import is limited to spreadsheets.

BUILD IT

Compel's AutoBuild tool can subdivide a bullet list into additional slides whose titles are taken from the bulleted items in the original slide. Though this is in effect a very primitive outliner, it is hardly a substitute for the real thing. The AutoBuild tool creates an automatic hyperlink between the original slide and the new ones. For instance, clicking on a bullet line in the original slide will move the show to the related AutoBuild slide. And clicking

▶ FACT FILE

Bravo! Version 2.0

List price: \$79. **Requires:** 286-based PC or better, 2MB RAM, 8MB hard disk space, DOS 3.1 or later, Microsoft Windows 3.0 or later. **In short:** Bravo! offers business users ample tools for presentations at an affordable price. It lets users customize graphs, text, and illustrations easily, but its multimedia capabilities are relatively limited.

Alpha Software Corp., 168 Middlesex Tpke., Burlington, MA 01803, 617-229-2924; fax, 800-952-8363, 617-272-4876.

537 on reader service card

SUITABILITY TO TASK		
	Power	Ease of Use
Traditional presentations	FAIR	FAIR
Multimedia integration	FAIR	FAIR
Presentation guidance	FAIR	FAIR
Workgroup support	FAIR	N/A
Output	GOOD	GOOD

on the title of one of the Auto-Build slides returns to the original bulleted list. Compel's Auto-Build tool also allows you to link multimedia elements, such as sound and .AVI files, to other slide elements such as text, images, or even other multimedia objects.

Compel lacks the graph or chart automating tool found in other products such as Harvard Graphics. In trying to animate charts and graphs in our testing, we were only able to achieve straight-line motion from vector point to vector point, rather than the better editable path-based animation found in other packages. Colors and fonts in the charts and graphs may be changed, but the size of letters, the placement of labels and legends, perspective, increments, and other attributes are predefined by the program.

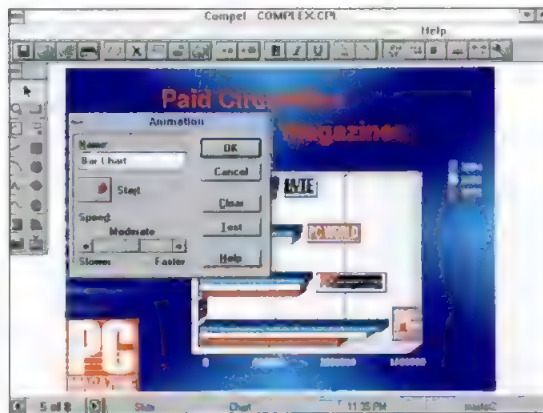
LOOSE LINKS

Because Compel doesn't have a time line, all the charts, graphs, bullets, text, drawings, and embedded objects on a slide have to be structured into a chain of events, called MediaLinks, which can occur either automatically or via clicks of the mouse.

When setting up slide transitions, we were able to assign a graphic to point to the active bulleted item. In addition, as each line in our test presentation was brought onto the screen, we used it to trigger other multimedia events, such as animation, sound, and embedded video clips. We could have also chosen from any of Compel's 29 attractive bullet selections (whose colors are editable), and the Paste-As-Bullet function allows any image to be used as a bullet. Unfortunately, Compel doesn't feature any text transitions.

MediaLinks work well if your slide contains only a couple of actions whose timing need not be precise. But during our testing, it became a jigsaw-puzzle-like challenge when we tried to design and manage the complex multimedia presentation. If time is a concern, Compel is not the program to choose for creating complex multimedia relationships.

Given the large number of Media-



By clicking the right mouse button on any object in Compel, you have access to all the options available for that object.

Links that can be embedded in a presentation, a useful Compel feature is the Media Packager. It automatically copies both the presentation file and all necessary media files in compressed form onto floppy disks to generate excellent runtime modules that run under Windows. If the presentation is large, Compel will span as many disks as necessary. The process is almost foolproof. In addition, the Media Packager verifies that all the media files and drivers that are called for are available on the computer. It creates a list to warn the user of what may be missing, which can save a presenter from some embarrassing moments.

▶ FACT FILE

Compel, Version 1.0a

List price: \$295. **Requires:** 386/20-based PC or better, DOS 3.1 or later, 2MB RAM, 4MB hard disk space, Microsoft Windows 3.1 or later. **In short:** Compel is hampered by its lack of basic features, including an outliner, text-import capabilities, and control over graphs and charts. Compel is designed for both traditional and multimedia presentations, but it won't satisfy users who have either need.

Asymetrix Corp., 110-110th Avenue NE, #700, Bellevue, WA 98004, 800-448-6543, fax, 206-637-1504

538 on reader service card

SUITABILITY TO TASK

	Power	Ease of Use
Traditional presentations	FAIR	FAIR
Multimedia integration	GOOD	FAIR
Presentation guidance	FAIR	FAIR
Workgroup support	N/A	N/A
Output	EXCELLENT	EXCELLENT

Compel's hotwords and hyperlinks are simple to create and operate. You simply designate a button, a graph, an object, or a word as a link to another slide or application. Then, when you click on the button or whatever object you have designated during your show, it will automatically launch the other application with the indicated file, or move to the other designated slide.

Ultimately Compel is hampered by a number of weaknesses. An outliner, predefined templates to automate presentation creation, and text-import features are essential for users who need to create a presentation quickly, and Compel has none of these. The addition of a time line and more customizable text transition effects would also bolster multimedia capabilities that were once considered cutting-edge, but are now showing their age.

Lotus Development Corp.

- **Freelance Graphics for Windows, Release 2.01**
- **Freelance Graphics for OS/2, Release 2.1**

BY STEVE GILLILAND

For the past few years, Lotus Development Corp.'s \$495 Freelance Graphics for Windows, Release 2.01, has been a lifesaver for those who find themselves deep in the creative end of a graphical presentation with orders to draw or drown. The multimedia-challenged Freelance Graphics for OS/2, Release 2.1, provides many of the same tools to produce attractive presentations quickly but isn't quite as easy to use. In both instances, however, Freelance Graphics, the pioneer of presentation, looks as if it's fallen behind on its own well-worn path.

EASE IS THE WORD

The success of Freelance Graphics is based on its logical, common-sense, and often imitated approach to presentation creation. Choosing one of 65 SmartMaster sets, each a group of 11 page layouts coordinated by color and design, begins an intuitive step-by-step process.

The title slide, for instance, says "Click here to type presentation title." Users who dread creating charts will marvel at the chart layouts. Data entry is simply a matter of entering information in the



Announcing Micrografx Designer™ Technical Edition. The best thing next to CAD.

It's amazing how much time you can save, just by having the right tools. So rather than use your CAD system for initial designs, presentations or documentation, use our new **Designer 4.1 Technical Edition**. It's got everything you need for technical illustration. And none of the frivolous things you don't need.



Precision Tools.

29 specialized tools make quick work of everything from sketches to detailed drawings.



Powerful Presentations and Output.

Use the full function slide show utility to create high impact presentations.

Fully Compatible.

Designer TE comes with 40 import/export filters (including .DXF, IGES and PageMaker 5.0).

Intuitive Interface.

Customize the toolbar with your most frequently used commands. The floating hint line and the context-sensitive "Help" give you constant feedback on what you're doing.

Pass your files to and from your CAD system with ease *and* reliability. Design with precision as tight as 1 μ . Create eye-popping presentations and detailed documentation. And do it all in a *fraction* of the time you're spending now. Hard to believe? Then call us on it. **1-800-894-6599**. We'll send you a 30-day trial copy on CD-ROM. *Free.**

We've also got a fantastic deal for those of you who own an earlier version of Designer.

Micrografx Designer 4.1 Technical Edition. Don't do CAD without it.



MICROGRAFX®

1 - 8 0 0 - 8 9 4 - 6 5 9 9



*Offer expires 3/31/95. There is a nonrefundable \$7.50 shipping and handling charge. Copyright © 1994 Micrografx, Inc. All rights reserved. 214-234-1769.

CIRCLE 230 ON READER SERVICE CARD



Performance Tests: Desktop Presentations

How We Tested

We evaluated these products on Compaq Deskpro 486/33M systems running DOS 6.2 and Microsoft Windows 3.1, each equipped with 8MB of RAM, a 310MB hard disk, and Helix NetRoom, Version 3.03, and Helix Multimedia Cloaking, Version 1, as our memory manager. We used the ATI Graphics Ultra Pro video board, which uses the ATI mach32 chip, with 2MB RAM running in 640-by-480, 256-color mode on NEC 4FG monitors, and we used the Media Vision Pro AudioStudio sound card with a SCSI host adapter to drive the NEC MultiSpin triple-spin CD-ROM drive. We installed Proteon p1392plus Token-Ring adapters running at 16MBps on a NetWare 3.12 network. The Microtek ScanMaker IISp, Adobe Photoshop 2.5.1, and Autodesk's Animator Pro were used in creating test files for the test-bed. We used Turbo Browser, from Pacific Gold Coast Corp., to help us manage and view multimedia files. We printed to the Tektronix 480 Color PostScript Printer and the

HP LaserJet III. Microsoft Video for Windows 1.1 was loaded on each of the systems for .AVI file playback. To test Freelance Graphics for OS/2, we used V Communications' System Commander to load Windows or OS/2 alternately on the system.

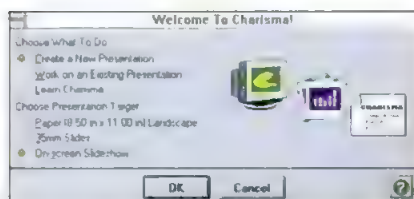
We ran all packages through the same testing script, which exercises the range of features needed to create both traditional and multimedia-based desktop presentations. While most packages are not adept at creating both types of presentations, the script, which is made up of a series of tasks, determines the limitations of each package by providing "back-downs," or alternative tasks, if the demands of the original task cannot be met.

In our testing script, we asked each reviewer to create two presentations: The short presentation and the complex presentation. Both were broken down into traditional and multimedia versions. In the short or "quick" presentation, the reviewers were given a 4-hour time limit and were asked to use all that the package offered to

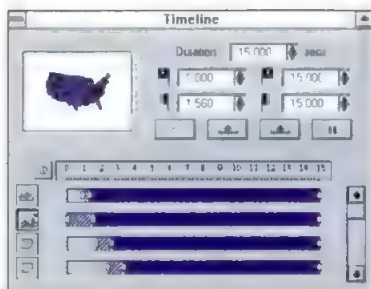
help one get up and running quickly.

In creating each presentation's charts, we used files in a variety of spreadsheet and word processor formats. Most packages provided import filters for several file formats. If a package could not import, we used the Windows Clipboard.

Packages vary greatly in their adeptness at creating multimedia presentations. Some packages handled the multimedia elements well while others stumbled and balked when we tried to play MIDI and .WAV files simultaneously, or when we tried to coordinate multimedia events. Creating the standalone multimedia runtime version of our complex presentation also proved to be a problem for some packages. The traditional desktop presentation packages, such as Freelance Graphics, Harvard Graphics, and Microsoft PowerPoint, had many problems with playing the test presentation back on our vanilla system, while the multimedia-proficient packages were mostly at a disadvantage in creating the traditional presentation. —Analysis written by Jeff Mace

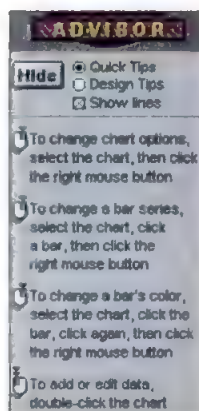


MICROGRAFIX CHARISMA'S OPENING SCREEN: We looked for packages to guide the user according to their output medium.

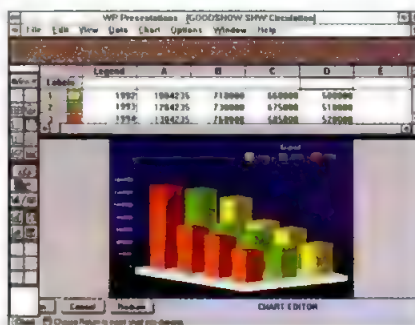


ASTOUND'S TIME LINE WINDOW: While creating multimedia presentations, we relied heavily on the time line, if it was available.

HARVARD GRAPHICS' ADVISOR: As we created our traditional presentation we noted whether or not products included guides for new or occasional users.



LOTUS FREELANCE GRAPHICS' SLIDE TEMPLATES: In our traditional presentation tests, we tried to use whatever guides were available as we entered text to each slide.



WORDPERFECT PRESENTATIONS' SPREADSHEET AND CHARTS: On our traditional presentation tests, we created data-driven charts using the products' native data-handling tools—usually a rudimentary spreadsheet. If none was available, we employed whatever integration with outside data-handling software each presentation product provided.



Paul - Manager/Parent :

"I needed a performance boost for my PC. It took a long time for my charts and presentations to appear on the screen. The colors were flat and limited. And my son's games ran slowly. But, I wasn't ready to buy a whole new system.

"Fortunately, I got great advice.

*For just \$299**, I got ATI's GRAPHICS XPRESSION.*

It revived my whole system.

"My friend had one.

Windows snapped open quickly. Charts popped up on his screen. The blazing speed, 37M Winmarks, was incredible. He said it offered best value for price/performance. And the improvement in color graphics and detail were most impressive.*

"Then, he showed me the

features. WinSwitch allowed him to switch between true color mode or high resolution mode without exiting Windows.

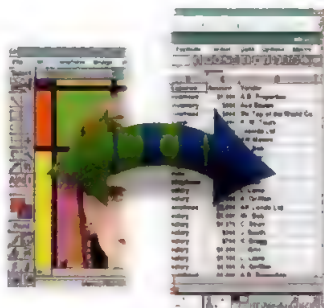
And ATI's FlexDesk+ software gave him total control over color, desktop size, resolution and even motion video acceleration.

"Finally, he told me it was the only affordable 64-bit accelerator for my ISA system.

I rushed out to buy one.

Installation was easy. There were no switches to set and the software guided me through the installation process. And I was amazed, it even came with a complete set of drivers for Windows, Windows NT, OS/2, CAD and DOS.

"Best of all, my PC now runs much faster in Windows, DOS and games. I almost never see that Windows hour-glass. GRAPHICS XPRESSION. At only \$299, it is still great advice."



WinSwitch changes color and resolution without leaving Windows



FlexDesk+ easy control of desktop settings



64-bit Accelerator



Perfecting the PC

"I got the advice I needed."

GRAPHICS XPRESSION

Affordable 64-bit Accelerator

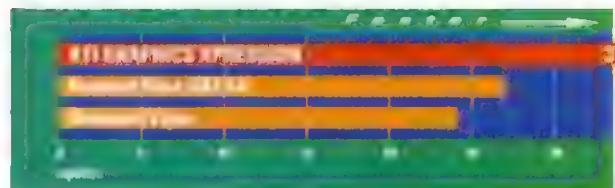
Fast 37M Winmarks (4.0)

Best Price / Performance Value

Instant Windows Mode Switching

NOW SHIPPING!

WINDOWS PERFORMANCE - WINBENCH 4.0*



Outperforms other accelerators in Windows and DOS

- Resolutions up to 1280x1024 non-interlaced
- Full acceleration in 256 to 16.7M colors
- Comes with enhanced driver support for Windows, OS/2 PM, Windows NT, CAD and DOS
- Up to 75Hz refresh rate
- Available for ISA, PCI or VESA Local Bus
- 2MB DRAM memory
- Five year limited warranty
- Priced at only \$299**



ATI TECHNOLOGIES INC.
33 Commerce Valley Drive East
Thornhill, Ontario Canada L3T 7N6
Telephone: (905) 882-2600 ext. 4111
Facsimile: (905) 882-2620
CompuServe: GO ATITECH
76004,3656

product's data-entry window. A thumb-nail preview of the chart format you've selected appears in a little icon in the corner of the data-entry window.

For those who think in terms of words instead of pictures, the outline view takes your typing directly to a slide. You can expand or collapse views, and you can select a range of items for promotion or demotion. Freelance Graphics also includes a full complement of drawing tools, including Bezier curves.

LIMITED MULTIMEDIA

Lotus says Freelance Graphics for Windows is targeted at a different audience than multimedia tools such as Action! for Windows, Astound for Windows, or Compel in the multimedia arena. Indeed, Free-

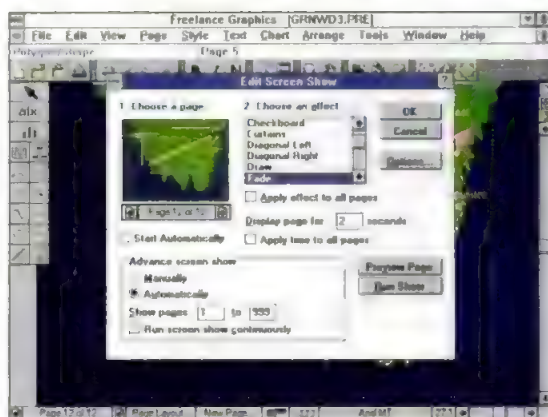
lance Graphics has nothing comparable with, for instance, the text animation or time line of Action!

Even so, Lotus Media Manager and Lotus Sound Recorder can add sound and movies to your Freelance Graphics for Windows presentation, and client/server support for OLE 1.0 and DDE provide the option of embedding sound and video from other applications. You can create buttons to start movies or sounds, jump to other slides, or launch outside applications.

Although there is no text animation, you can choose from among 32 different transitions, including checkerboard, pans, wipes, and fades, to enliven slide changes. Also, you can build bulleted lists in a number of different ways, based on your output medium. For transparencies and 35-mm slides, for instance, bullet lists can be automatically broken up across several slides.

Freelance Graphics hasn't seen a significant upgrade in more than a year, and in that time other traditional presentation products have stepped in and duplicated its presentation guidance tools, enhancing them in ways Freelance Graphics users have only dreamed of. Some areas in which the package has fallen behind are obvious, such as the now too-often-seen collection of clip art. Others, such as its limited color support, are more esoteric yet equally important. Although other products provide a means to deal with colors outside a 256-fixed-color palette while working in 8-bit mode, Freelance Graphics offers no easy way to remap colors. As a result, if a piece of clip art from a third-party library falls outside Freelance Graphics' color collection, it may adversely affect the entire presentation's color palette.

Lacking multimedia capabilities, Freelance Graphics for OS/2 does not, in the strictest sense, fit our filter. But its designation as nearly the only presentation product on OS/2 and its solid integration with Lotus 1-2-3 for OS/2 made it worth looking at in this context. But while Freelance Graphics for OS/2 mirrors its Windows sibling in many areas, with just 43



Freelance Graphics for Windows simplifies editing screen-show parameters by providing a choice of transitions and on-screen slide times.

SmartMaster sets and no tutorial to speak of, it falls noticeably behind in others.

Freelance Graphics for Windows, however, is a seasoned program that has set many of the standards currently used in presentation graphics. Version 2.01 now integrates with Lotus Notes and the Notes F/X programming interface (a marriage that enables both versioning and presentation database access in Freelance Graphics), a feature that will be improved in Version 2.1 for Windows, which should be available by the time you read this. The next version will also include more SmartMasters and will introduce a Microsoft PowerPoint 3.0 filter.

Freelance Graphics' relatively minimal multimedia support and lack of 8-bit color support can be a hindrance, but its biggest problem may be that it's been copied too often and too well. So well, in fact, that the pretenders are now the contenders. But if you're not confident in your artistic abilities and don't need presentations full of sound and fury, and especially if you're a Lotus Notes user, Freelance Graphics for Windows could still be the right presentation graphics package for you.

Software Publishing Corp.

EDITORS' CHOICE
Harvard Graphics 2.0
for Windows

BY DANIEL GROTTA AND
SALLY WIENER GROTTA

With the \$395 Harvard Graphics 2.0 for Windows, Software Publishing Corp. has beefed up usability, automation, and

▶ FACT FILE

Freelance Graphics for Windows, Release 2.01

Freelance Graphics for OS/2, Release 2.1

List price: \$495 **Requires:** 386-based PC or better; Windows version: 4MB RAM, Microsoft Windows 3.1 or later, OS/2 version: 6MB RAM, OS/2 2.1 **In short:** Easy to learn and use, Freelance Graphics for Windows is a good choice for traditional presentations but not for multimedia ones. You would be better off waiting for the next release of Freelance Graphics for OS/2, however

Lotus Development Corp., 55 Cambridge Pkwy., Cambridge, MA 02142, 800-343-5414, 617-577-8500, fax, 617-693-4551

539 on reader service card

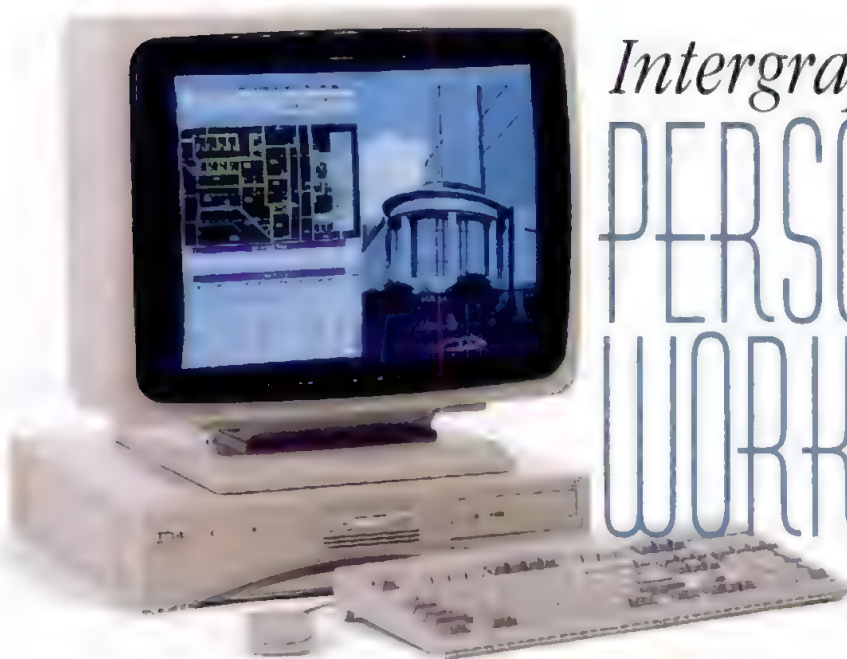
SUITABILITY TO TASK (WINDOWS)

	Power	Ease of Use
Traditional presentations	GOOD	EXCELLENT
Multimedia integration	FAIR	FAIR
Presentation guidance	GOOD	GOOD
Workgroup support	GOOD	GOOD
Output	GOOD	GOOD

SUITABILITY TO TASK (OS/2)

	Power	Ease of Use
Traditional presentations	FAIR	FAIR
Multimedia integration	N/A	N/A
Presentation guidance	FAIR	FAIR
Workgroup support	FAIR	FAIR
Output	FAIR	GOOD

Powerful, but personal.



Intergraph's PERSONAL WORKSTATIONS

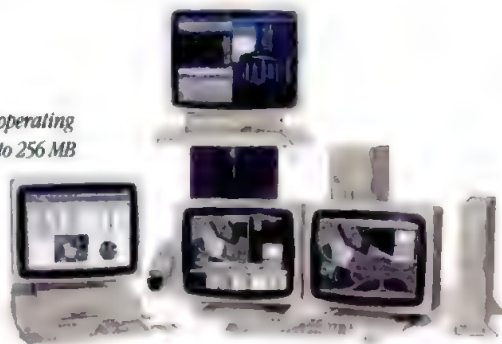
Finally. A single system combining workstation power with PC personality — the personal workstation from Intergraph

- Performance and power of a workstation
- Personality, compatibility, and affordability of a PC
- Productivity tools integrated with advanced technical applications
- Popular, easy-to-use Microsoft Windows operating environment
- Professional display technology and the industry's broadest monitor selection
- Packaged, ready-to-run systems with built-in networking and graphics
- Path for growth as your computing needs expand
- Perfectly designed for a safe and comfortable work environment

Powerful, but personal.

A family of personal workstations from Intergraph.

- Single or dual 90 MHz Intel Pentium processors
- Windows NT or Windows/DOS operating system
- 512 KB external cache
- High-performance 3D graphics accelerators
- 16 to 256 MB internal memory
- Choice of single and dual 17-, 20-, 21-, and 27-inch color display systems with up to 16.7 million colors
- 540 MB, 1 GB, or 2 GB Fast SCSI-2 disk
- Integrated Ethernet
- 3.5-inch, 1.44 MB floppy disk drive
- CD-ROM
- EPA Energy Star compliance
- 3 year limited warranty
- Worldwide sales, service, and support



For more information
or the number of a sales
representative or
business partner near you,
call 800-345-4856.

INTERGRAPH
COMPUTER SYSTEMS

CIRCLE 048 ON READER SERVICE CARD

Intergraph and the Intergraph logo are registered trademarks of Intergraph Corporation. The Intel Inside and Pentium Processor logos are trademarks of Intel Corporation. Microsoft is a registered trademark and Windows and the Windows logo are trademarks of Microsoft Corporation. Other brands and product names are trademarks of their respective owners.
Copyright 1994 Intergraph Corporation, Huntsville, AL 35894. 0201 DDAD120000

guidance for presentation fundamentals. In the process, the company has claimed an impressive piece of the traditional presentation territory once thought to be the sole province of Lotus's Freelance Graphics for Windows.

Harvard Graphics is designed to get you working quickly. In fact, within half an hour after installing the program on our test machine, we had taken one of the product's Five-Minute Coach on-screen tutorials, which actually took about 13 minutes to complete, and developed our test presentation. We achieved this speed and productivity because Harvard Graphics' context-sensitive help, along with the Quick Looks and Advisor tools, provides valuable assistance at almost every step.

The Advisor is an optional panel that appears alongside the slide view that offers Quick Tips and Design Tips, which guide beginners through the creation of presentations. Quick Looks, which are thumbnail representations that show how choosing an option will change the look of your slide, takes the guesswork out of many dialog boxes. Harvard Graphics also has the ability to create fully customizable icon bars.

This ease of use is coupled with powerful functionality in traditional presentation features. These include an impressive out-

■ Looking Ahead: *Impact and Persuasion*

By Lance Ulanoff

An interesting correlation exists between a new Claris product and a revised Aldus product expected to be released in the next six months. Aldus Persuasion, Version 3.0, and Claris Impact for Windows are being called "combinations" of tools (dare we say "suites"?) for creating presentations and business graphics.

ALDUS PERSUASION

Aldus Corp.'s slogan could be "We will sell no product before its time."

It's been two years since Aldus last upgraded Persuasion, and you might wonder if the new version will be worth the wait or if Aldus is too late to compete in today's easy-to-use desktop presentations market.

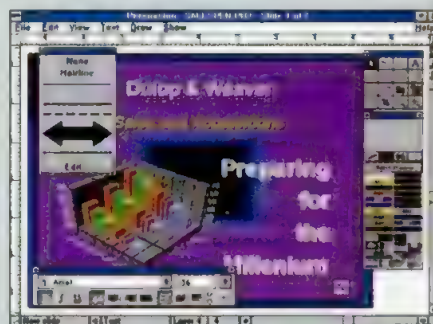
A sneak peek at the product, which should ship sometime this fall, shows that it just might be worth the long wait. Aldus has added some strong features and has completely revamped Persuasion's interface to make the product easier to use.

Instead of focusing on integration with other applications, Version 3.0 of Persuasion will be sold as a product that contains all the tools you'll need to create a presentation. These include an outliner, a very basic word processor, drawing and charting modules, a table editor, an automatic speakers' notes and audience handouts generator, a slide sorter, and a runtime slide presenter. Nevertheless, Persuasion 3.0 will be an OLE 1.0-compatible app, and will accept data and text from a variety of outside word processors and spreadsheets.

One of the primary ways Persuasion 3.0 can still be easy to use, despite its wealth of features, is with expandable, floating palettes. Most every important feature that was once found under the pull-down menus and dialog boxes will be available through these palettes.

Persuasion 3.0's increased power will be visible in its more sophisticated chart types and control tools. It will add radar, polar, spectral map, histogram, bubble, and high-low-open-close charts to its standard chart

list. The product's drawing and output capabilities will remain strong and will be augmented with advanced color management to address a variety of output needs.



Aldus Persuasion 3.0 should feature floating palettes and editable 3-D charting abilities.

CLARIS IMPACT

More of a hybrid

product than a straight presentation graphics software, Claris Impact, which will be among the first of a slew of graphics products that should ship shortly after Windows 4.0 is released, will offer eight integrated tools for creating business graphics and presentations. Although presentations will be listed as only one of the product's eight components, all of the remaining seven can be used to create and enhance your presentations. The other tools will include a word processor, a flow charter, an org chart maker, a spreadsheet, a calendar, and a time line.

The presentation module will include most of the standard tools you would expect in any traditional product. Among them are design templates, multimedia support, boilerplate transition effects, auto-play, and rudimentary slide sorting. □

► FACT FILE

Harvard Graphics 2.0 for Windows

List price: \$395; upgrade, \$89 **Requires:** 386-based PC or better, 4MB of RAM, 8MB hard disk space, DOS 3.1, Microsoft Windows 3.1 or later **In short:** Harvard Graphics is a superb traditional presentation product. It is best suited for users who need to create professional-looking presentations with an impact without spending a lot of time learning how to use the program.

Software Publishing Corp., 3165 Kifer Rd., P.O. Box 54983, Santa Clara, CA 95056-0983, 800-234-2500, 408-986-8000, fax, 408-980-0729

\$40 on reader service card

SUITABILITY TO TASK

	Power	Ease of Use
Traditional presentations	EXCELLENT	EXCELLENT
Multimedia integration	FAIR	FAIR
Presentation guidance	GOOD	EXCELLENT
Workgroup support	GOOD	GOOD
Output	GOOD	EXCELLENT



In the cockpit of every Delta Air Lines jet you'll find something absolutely

critical to safe, legal, and efficient air travel: a FrameMaker® document. It's called a Minimum Equipment list, and it's also available on-line, for access via radio from dispatchers on the ground.  It's one of many operational, technical, and administrative manuals that Delta writes and publishes in FrameMaker. Because FrameMaker gives Delta the functionality and flexibility they need to create, update, and consolidate their extensive documentation.  Particularly attractive were features like automatic indexing. Superior graphics handling.

Multiplatform capabilities for file compatibility across PCs, Macintoshes, and UNIX systems. And of course,



on-line document distribution, complete with automatic hypertext links, through FrameViewer.®  So don't just settle for any old publisher — fly first class with FrameMaker 4. Call 1-800-U4-FRAME Ext. 619 today for our comprehensive Guide To Document Publishing. And watch your publishing department really take off

with FrameMaker 4.  **Frame**

CIRCLE 105 ON READER SERVICE CARD

BEFORE THEY EVER LEAVE THE GROUND,
THE PILOTS AT DELTA
GET CLEARANCE FROM FRAMEMAKER.

liner and strong charting and graphing abilities. In addition to featuring a built-in spreadsheet used to create data-driven charts, Harvard Graphics can import data from Excel and Lotus 1-2-3 files, as well as

MULTIMEDIA TROUBLES

Where Harvard Graphics falls short is in multimedia. Its support of animation is rather weak: Every time we tried to embed an .FLC file, the computer froze, and the program offers no time line-like tool to manage multimedia events. But Harvard Graphics doesn't claim to be anything more than a traditional program with a few multimedia bells and whistles.

Harvard Graphics' runtime module isn't very strong, either. For presentations larger than 1.44MB, the runtime generator cannot span floppy disks. Instead, you have to divide the presentation into several smaller files, and there are no tools or instructions for doing this. And while the package successfully

exported traditional and Autobuild slides to the runtime module, in our experience it didn't maintain any of the embedded sound files or bullet transitions.

Unlike the other presentation programs we tested, Harvard Graphics is specifically designed to play presentations across a network. The program's Conferencing feature can display a presentation on up to 64 computers logged onto the same network server. For privacy, you can assign a password to the conference. The Conference moderator has full control and can make annotations on the slides. He or she can relinquish that control to any participant and reclaim it at any time. Participants can also send messages to one another without disrupting the show.

By the time you read this review, Harvard Graphics 3.0 should be available. It will feature better animation tools and clips, and other enhancements will include context-sensitive advice buttons; a Design Checker in the Advisor, which will list the items that break basic design rules; Quick Presentations sample templates designed around common business themes; and import filters for CorelDRAW, EPS, and Kodak Photo CD files.

The next release of Harvard Graphics will further enhance an already excellent

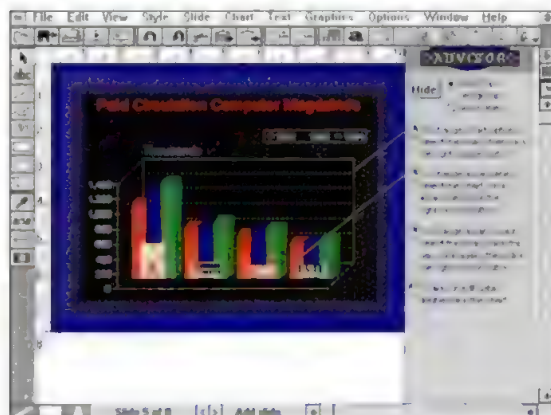
product, but if you have no need for the extra features promised in Version 3.0, there's no reason to wait. If you want an excellent traditional presentation program that guides you through every step, and you don't care about multimedia support, Harvard Graphics 2.0 for Windows delivers.

Micrografx Inc.

• Micrografx Charisma

BY LORI GRUNIN

The \$495 Micrografx Charisma, Version 4.0, presents all of the necessary qualifications to move into the desktop presentation niche that Aldus let go as Persuasion aged. With the best set of drawing tools among our tested products—including extrusion, warping, and named colors; an Effects Browser for adding special effects such as embossing to bitmaps; the ability to mix and match formatting styles to the nth degree; and peerless control over slide layout—this package definitely has the potential to be the power designer's chosen tool. It also stands up very well against products such as Action! and Astound for Windows for creating standalone multimedia presentations. Unfortunately, general instability and an occasionally confusing interface prevent us from endorsing Charisma wholeheartedly.



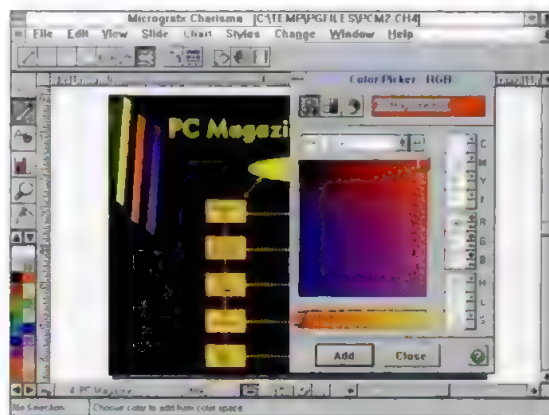
Harvard Graphics' on-screen Advisor provides Quick Tips and Design Tips to help users learn the program quickly.

from .DBF databases. Each item in a chart or graph can be edited for color, font size, 3-D proportions, and fill. You can place legends in any position inside or outside the graph, and all labels can be horizontal, vertical, or slanted. To pull a slice out of a pie chart, you simply click on the segment and drag it outward.

The Autobuild feature will incrementally build a chart, bullet list, or graph during your show. With bar charts, for example, each type of bar is placed onto the screen sequentially.

You also have the ability to edit both master and slide templates in Harvard Graphics. When editing the master template, you can change title and subtitle styles in addition to altering various other graphical elements for all the slides that make up a presentation. On the other hand, editing slide templates will only affect the graphical elements used on individual slides, such as the type of chart used.

Although Harvard Graphics can place text along a path, the really exciting special effects for text and graphics come from Harvard F/X, a bundled applet that links to Harvard Graphics via OLE 1.0. Harvard F/X provides access to sophisticated drawing and shading and to other functions usually associated with more complex drawing programs. Harvard Graphics also ships with 530 pieces of editable clip art.



The ability to create named colors is one of the many tools Micrografx Charisma offers the graphically inclined user.

Newcomers to presentation creation may be confused by Charisma, since it doesn't hold your hand quite the way Free-lance Graphics or Harvard Graphics does. There's a basic on-line tutorial to get you started and on-line help along the way, but that's about it. Charisma does include a help file that intelligently covers selecting

THERE ARE A
NUMBER OF
AFFORDABLE PRINTERS

THAT PRODUCE
LASER-QUALITY IMAGES
IN BLACK AND WHITE.

This SHOULD
BREAK THE PATTERN.



With the new Canon BJC-4000, you can now get superior-quality black and white performance, as well as color, without having to break the bank. Its standout performance includes laser-sharp 720 x 360 dpi in monochrome. A five page per minute print speed. And vibrant 360 dpi in color. For more information or your nearest Canon dealer call 1-800-848-4123.

Canon

and mixing typefaces from the myriad TrueType and Type 1 fonts supplied on the CD-ROM that accompanies the product, something that no other product addresses.

COMFORTING FAMILIARITY

Micrografx Designer and Picture Publisher users will instantly recognize Charisma's easy-to-use toolbar and context-sensitive ribbon-bar interface. Charisma covers all the basics and uses the traditional placeholder metaphor for entering elements. Entering, editing, and formatting text should come easily to most users; in addition to selecting bullets from any font, you can also turn any graphic into a bullet. Text imported into the outliner took a bit of cleaning up, though, a marginally frustrating task since we couldn't select more than one point at a time.

The charting is more than just marginally frustrating, however. Charisma creates true 3-D charts and offers a reasonable selection of business graphs—as with the previous version, you can create chart folders with custom settings—but it uses a totally different interface for the charting module than for the rest of the product. Version 4.0 has a panel down the right side of the screen that takes up a lot of screen real estate. You can move individual chart elements and even format them in groups, but you can't move chart elements in a group. And a known bug makes Charisma refuse to remember any custom label placements you make on 3-D charts.

The illustration tools are a good subset of those found in Designer, the company's high-end illustration package; these come in handy for creating custom master designs, one of the product's main strengths. Each master contains a color scheme, a text scheme, background objects, and a slide background. To generate a new template, you can either start from scratch or import different elements from different presentations or existing templates. To generate a new template from an existing slide, you simply choose Template/Create under Slide on the menu.

HANDLING THE SHOW

Although Charisma lacks a time line for synchronizing multimedia events, using layers gives you essentially the same control over timing. Events on each layer oc-

▶ FACT FILE

Micrografx Charisma, Version 4.0

List price: \$495 **Requires:** 486/33-based PC or better, 8MB RAM, 12MB hard disk space, DOS 3.1, Microsoft Windows 3.1 or later. **In short:** Version 4.0 of Micrografx Charisma is the most powerful all-around desktop presentation package in this roundup. But the product's appeal is blunted by an inconsistent user interface and general instability.

Micrografx Inc., 1303 E. Arapaho, Richardson, TX 75081, 800-758-1985, 214-234-1769; fax, 214-994-6334

541 on reader service card

SUITABILITY TO TASK		
	Power	Ease of Use
Traditional presentations	EXCELLENT	GOOD
Multimedia integration	GOOD	GOOD
Presentation guidance	FAIR	FAIR
Workgroup support	N/A	N/A
Output	GOOD	EXCELLENT

cur simultaneously, so by assigning various objects, events, and transitions to different layers, you can produce a fairly complex multimedia presentation. In addition to the sound, video, and animation placed on individual layers, you can assign background sounds, in .WAV or MIDI format, to play for the duration of the slide. When you break the layers apart in the slide sorter, the program gives you a coherent snapshot of the order in which objects enter the slide, something that Action! and Astound lack. But Charisma doesn't support animation, except via imported .FL* files. You can create hyperlink buttons that launch a media event, jump to another slide, or launch an application (and either stop there or return to your presentation when you quit). For distribution, Charisma intelligently creates standalone .EXE files, and copies linked files automatically.

Charisma is the most flexible of any of the packages we tested when it comes to the layout of handouts and speakers' notes; you can lay out the notes page with text and thumbnail placeholders (you enter the notes text separately) and lay out

thumbnail placeholders for handouts. Print quality is acceptable.

Unfortunately, our whole testing experience was marred by random, unreproducible crashes, which were occasionally related to poor resource management. Display in 256 colors was similarly disappointing on our tests. The product's text engine also slows considerably when you have a large number of fonts on your system.

Despite crashes and problems, we were still able to create several completely customized presentations in under 12 hours, and we fundamentally like the product. Charisma, like a diamond in the rough, needs some polishing before we can see its sparkle.

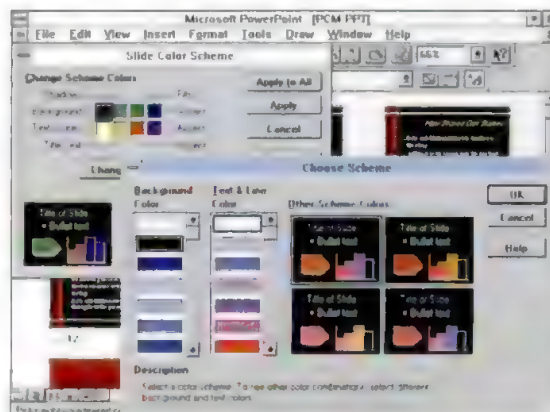
Microsoft Corp.

• Microsoft PowerPoint

BY LORI GRUNIN

At first, many software packages can seem like uncharted wilderness fraught with peril. But with dozens of signs to point the way, including Wizards, Cue Cards, Tips of the Day, ToolTips, and plain old on-line help, it's pretty hard for an infrequent user to get lost in Microsoft PowerPoint, Version 4.0. As long as you create predominantly text-based presentations, need to draw relatively simple graphics, or don't use complex data sets for your graphs, PowerPoint will serve you fine. For off-the-beaten-path features such as real sound and video support or flexible master design, however, PowerPoint lacks power.

The program offers several ways to get started, in addition to the common methods of choosing a template or starting



Microsoft PowerPoint's method for choosing custom color schemes is one of the easiest for novice presentors to use.

Q: What's the best value for your marketing dollar?



A: Reprints, of course!

Dollar for dollar, you just can't beat a reprint of a great review; and there's never been a better time to order. Faster turnaround times and price incentives make this a great time to have your product review or advertisement reprinted. Why not call today? It really makes "cents!"

Contact: Marcia Hazell (212) 503-5412

Carol Peters, Reprints Manager; Ziff-Davis Publishing Company.

ZIFF-DAVIS REPRINTS

ONE PARK AVENUE 16th FLOOR NEW YORK NEW YORK 10016

SUMMARY OF FEATURES

Desktop Presentations



Products listed in review order

■ = YES □ = NO

	Action! for Windows, Version 3.8	Astound for Windows, Version 1.5	Bravo!, Version 2.0	Compel, Version 1.0a	Freelance Graphics for Windows, Release 2.01	Freelance Graphics for OS/2, Release 2.1	Harvard Graphics 2.0 for Windows
List price	\$199	\$399	\$79	\$295	\$495	\$495	\$395
General Features							
Operating environment	Windows	Windows	Windows	Windows	Windows	OS/2	Windows
Supports DDE	■	□	■	□	■	■	■
Supports OLE 1.0/2.0	■ ■	■ □	■ □	■ □	■ □	N/A ¹	■ □
Charting							
Text and data import							
Importable text formats:							
Ami Pro/ASCII	□ □	□ ■	□ ■	□ ■	□ ■	□ ■	□ ■
.RTF/Word for Windows	□ □	■ □	■ □	□ □	□ □	□ □	□ □
WordPerfect	□	□	□	□	□	□	□
Importable chart and data formats:							
Excel chart/data	■ ■	□ ■	□ ■	□ □	□ ■	□ □	□ ■
Lotus 1-2-3 chart/data	■ ■	□ ■	□ ■	□ □	■ ■	■ ■	□ ■
Importable presentation formats							
Charisma	□	□	□	□	□	□	□
Freelance Graphics for Windows	□	■	□	□	■	■	□
Harvard Graphics	□	□	□	□	■	□	■
PowerPoint	□	■	□	□	■	□	□
WordPerfect Presentations	□	□	□	□	□	□	□
Chart creation							
Can create bullet charts	■	■	■	■	■	■	■
User-defined bullet style	■	■	■	■	■	■	■
Can create data-driven charts	■	■	■	■	■	■	■
Can create 3-D charts	■	■	■	■	■	■	■
Chart editing and formatting							
User can edit text directly on chart	□	□	■	■	■	■	■
User can scale chart to fit	■	■	■	■	■	■	■
User can interactively rotate 3-D chart	□	■	■	□	□	□	□
Sound Integration							
Importable audio file formats							
MIDI	■	■	■	■	■	N/A ²	■
.WAV	■	■	■	■	■	N/A ²	■
Sound manipulation							
Records sounds	□	■	□	■	■	N/A ²	■
Duplicates sounds	■	■	■	■	■	N/A ²	□
Fades out	□	■	□	□	■	N/A ²	□
Loops	■	■	□	■	■	N/A ²	■
Plays multiple sounds simultaneously	■	■	■	■	□	N/A ²	□
Synchronizes with video	■	■	□	■	□	N/A ²	□
Video and Animation Integration							
Video manipulation							
User can edit video clips	■	□	□	■	□	N/A ²	□
User can crop video to viewer window	□	■	□	■	□	N/A ²	■
User can loop video clips	■	■	□	■	■	N/A ²	■
Importable video file formats							
AVI/ FLC	■ ■	■ ■	■ ■	■ ■	□ □	N/A ²	■ □
.FLI/ MOV	■ ■	■ ■	■ □	■ ■	□ □	N/A ²	□ □
MMM	■	□	□	■	□	N/A ²	□
Animation manipulation:							
Can animate chart/text	■ ■	■ ■	□ □	□ ■	□ □	N/A ²	□ □
Can animate graphical elements	■	■	□	■	□	N/A ²	□
Can animate imported clip art	■	■	□	■	□	N/A ²	□
User can edit animation	■	■	□	■	□	N/A ²	□
User can edit animation along a path	■	■	□	■	□	N/A ²	□
Clip Media							
Importable graphics formats:							
CGM/.PCX	□ ■	■ ■	■ ■	■ ■	■ ■	■ □	■ ■
Photo CD/TIFF	■ ■	■ ■	■ ■	■ ■	■ ■	□ □	□ ■
Bitmapped files and metafiles	BMP, .WMF	.BMP, .WMF	BMP, .WMF	.BMP, .WMF	.BMP, .WMF	OS/2 Presentation Manager files	.BMP, .WMF

N/A¹—Not applicable. This feature is not supported under OS/2. N/A²—Not applicable. This product does not support multimedia.

from scratch. If you only have a vague idea about what you want to say, the AutoContent Wizard will help you to generate a rough outline based upon the type of presentation you need to give (such as a training lecture or a progress report). If you know what you want to say but need help choosing a master design or selecting support materials, such as speakers' notes and handouts, you can start off with the Pick a Look Wizard instead. As has become an industry standard metaphor, you click on placeholders for text, graphics, or charts to enter those elements.

One of PowerPoint's strongest assets is its intelligent layout and formatting capabilities. When you import an outline, for instance, all the text goes directly into the proper placeholders. In addition to the normal title placeholder, AutoLayouts feature an object area placeholder, which controls the location of all body text and graphical placeholders on each slide. While standard slide templates let you adjust only the slides linked to them, AutoLayouts let you quickly and easily redefine element placement for an entire presentation. On the flip side, however, you can't define and save custom layouts.

The program handles text entering and import very well, with one significant exception: Although it supplies an Auto-Layout for a two-column bullet chart, the text for the second column never appears in the outliner.

Tools such as the ability to go through selected paragraphs and add or remove periods and change case make attaining textual consistency across a presentation quick and easy. The Format Painter lets you pick up the attributes of a text or graphical object and apply them to another; this alone speeds presentation creation considerably. PowerPoint lets you perform global font substitutions, which eases sharing of presentations with other members of your company.

For data charting, PowerPoint uses the Microsoft Graph, Version 5.0, OLE server, which provides a reasonable selection of chart types, including doughnut and radar charts. You can also save customized chart formats, although this feature is buried a little further down in the program than it should be. While sufficient, the data sheet

List price: \$495 **Requires:** 386-based PC or better, 4MB RAM, 10MB hard disk space, DOS 3.1 or later, Microsoft Windows 3.1 or later **In short:** If you need to create text-intensive or hard copy-based presentations, you are a new or infrequent presenter, or you require superior integration with other Microsoft products, Microsoft PowerPoint is an excellent choice

	Power	Ease of Use
Traditional presentations	GOOD	EXCELLEN
Multimedia integration	FAIR	FAIR
Presentation guidance	GOOD	GOOD
Workgroup support	FAIR	GOOD
Output	GOOD	GOOD

is still pretty inflexible.

The drawing tools offer a similarly mixed bag. In addition to a set of standard tools, the program provides AutoShapes, which are predefined shapes that also function as irregularly shaped text boxes. If you import bitmaps, Recolor Picture can be invaluable. It lets you remap the colors in a palette-based image. Although it can't make a color transparent, it can be used to change the bounding box fill of a bitmap to match your slide background. PowerPoint also includes a basic Organization Chart Tool, although this easy-to-use but fairly inflexible OLE 1.0 server feels as if it is tacked onto the rest of the product.

MULTI-MEDIUM

Users interested in adding sound, animation, or video to their presentations should look elsewhere. Most multimedia in PowerPoint operates via OLE, which is to say not very well. You can create automatic slide builds from the outline, but builds are limited to body text placeholders, and you can build only first-level bullets (lower-level bullets enter with each first level bullet). Rehearsal mode lets you practice your presentation while automatically tracking how long you spend on each slide; the program can then update your automatic slide transition timings with new ones.

► SUMMARY OF FEATURES

Products listed in review order

■ = YES □ = NO

PC MAGAZINE
EDITORS' CHOICE

PC MAGAZINE
EDITORS' CHOICE

	Action! for Windows, Version 3.0	Astound for Windows, Version 1.5	Bravo! Version 2.0	Compel Version 1.0a	Freelance Graphics for Windows, Release 2.01	Freelance Graphics for OS/2, Release 2.1	Harvard Graphics 2.0 for Windows
Clip Media (continued)							
Number of clip art images supplied	700	1,000	69	350	530	N/A ²	536
Number of sound clips supplied	380	189	None	315	13	N/A ²	None
Number of live video clips supplied	None	15	None	78	None	N/A ²	None
Number of animation clips supplied	150	197	None	90	None	N/A ²	None
Text Handling							
Can add special effects to text	■	■	■	■	■	□	■
Automatically creates progressive builds	■	■	■	■	■	■	■
From outline mode	■	■	■	□	■	□	■
From slide mode	■	■	■	■	■	■	■
User can adjust kerning and leading	■	■	■	□	□	□	□
User can align text on baseline	■	□	■	□	■	■	□
User can rotate text	□	□	■	■	■	■	■
Illustration and Image Manipulation							
Number of illustration tools	6	20	10	13	■	8	25
Image-manipulation tools							
Can align to baseline/objects	■ ■	□ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Can group objects/break grouped objects apart	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Can resize objects	■	■	■	■	■	■	■
Presentation Management							
Offers multiple backgrounds per presentation	■	■	■	■	■	■	■
Can suppress background for individual slide	■	■	■	■	■	■	■
Number of predefined templates	300	59	35	127	65	65	31
Number of multimedia templates	300	59	None	4	2	N/A ²	None
Presentation organization							
Slide sorter	■	■	■	■	■	■	■
Outliner	■	■	■	□	■	□	■
Speakers' notes	□	■	■	■	■	□	■
On-Screen Presentations							
Hyperlinks to other slides	■	■	■	■	■	□	■
Hyperlinks to other applications	□	■	■	■	■	□	■
User can launch Windows events	□	□	■	■	■	□	■
Number of transition effects	46	26	11	40	32	1	31
Offers multiple transitions per slide	■	■	■	■	□	□	■
Provides on-screen annotation tool	□	■	■	□	■	□	■
Can overlay images	■	■	■	■	■	■	■
Runtime module:							
Supports DOS/Windows	□ ■	□ ■	□ ■	□ ■	■ ■	■ ■	■ ■
Supports OS/2	□	□	□	□	■	■	□
Supports interactive/automatic operation	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	□ ■
Automatically incorporates all necessary files	□	■	■	■	■	■	■
Includes pointers to all necessary files	□	□	■	■	■	■	■
Runtime file format	ACP	.EXE	.SCP	.EXE	.SHW	.SHW	.PLY
Output							
To slides	□	■	■	■	■	■	■
To transparencies	■	■	■	■	■	■	■
To printer	■	■	■	■	■	■	■
Print options							
Black and white on-screen printer preview	□	□	■	□	■	■	■
Prints handouts	□	■	■	■	■	■	■
Prints speakers' notes	□	■	■	■	■	□	■
Can suppress slide background	■	■	■	■	■	□	■
Can suppress slide gradients	■	■	■	■	■	□	■
Converts colors to gray scale	■	■	■	■	■	■	■
Converts colors to pattern fills	■	□	□	□	■	■	■
Maximum number of slides per page	4	6	24	16	6	6	6
Documentation and Support							
Tutorial	■	■	■	■	■	■	■
Free technical support hours (eastern time)	10:00-7:00 M-F	9:00-8:00 M-F	9:00-6:00 M-Th, 10:00-6:00 F	9:00-9:00 M-Th, 9:00-6:00 F	8:00-8:00 M-F	8:00-8:00 M-F	10:00-7:00 M-F

N/A²—Not applicable. This product does not support multimedia. * This product does not support embedded video in DOS.

SEPTEMBER 27, 1994 PC MAGAZINE 287

make different backgrounds from scanned or drawn images. Linking slide sequences to make an interactive show is an easy and straightforward task.

WordPerfect Presentations' charting capabilities are also impressive. The package imports from Excel and can create 3-D charts, and every chart element is rotatable.

The multimedia capabilities in WordPerfect Presentations are limited. And al-

though you can directly import and record audio files, you still have to import .AVI files through Windows OLE. Because WordPerfect Presentations doesn't feature a time line, you have no control over when the media clips play within a slide. And when we tried to play .AVI, MIDI, and .WAV files on our test system at PC Labs, these audio elements sounded choppy.

.AVI files are even more problematic

when they're incorporated into runtime presentations. Furthermore, WordPerfect Presentations has only about a dozen transition effects, while other packages feature many more visually exciting transitions, such as spirals and explosions.

Learning to create a slide show from scratch and then perfect it proved a daunting and time-consuming task. WordPerfect Presentations features a series of brief self-running demos, called QuickTutors, that illustrate how to perform common tasks, including editing templates and applying transitions. We found the QuickTutors too simplistic and sparse to help substantially. In a similar vein, the context-sensitive help and a help subroutine called How Do I... offer the user only rudimentary information.

Because there is no on-screen interactive tutorial, you have to plod through the overly detailed 351-page Lessons/Quick Solutions book. What's more, the documentation was printed several months before the program was released and hasn't been updated since. This explains why some of the screens and commands don't relate to the written instructions. For instance, Lesson 3 gives step-by-step instructions on using the drawing tool to contour text above a line, but following it faithfully will produce a jumble of letters.

Considering that this is a WordPerfect product, it comes as a surprise that WordPerfect Presentations features relatively weak text-handling capabilities. Only text formatted by WordPerfect 5.0, 5.1, or 5.2 imports directly into the outliner; you must import ASCII and other formats under Chart Editor. While the package can warp, distort, and contour text, it cannot create 3-D lettering or adjust leading.

WordPerfect is preparing a major upgrade, WordPerfect Presentations 3.0 for Windows. In addition to having a much-improved interface, it will greatly expand the learning aids, provide seamless integration with other WordPerfect products, enhance text capabilities, and add or update various other features. It will also be able to import Harvard Graphics 2.x and 3.0 for DOS and Microsoft PowerPoint 2.0 and 3.0 for Windows files. If you want to use WordPerfect Presentations, we strongly suggest waiting for Version 3.0. □



"Surely...we have a better option than these!"

Yes, you do.

Turn your excess inventory into a tax break
and help send needy kids to college.

Call for your free guide to learn how
donating your slow moving inventory
can mean a generous

TAX WRITE OFF for your company.

Call (708) 690-0010

EAL

P. O. Box 3021
Glen Ellyn, IL 60138
Fax (708) 690-0565

Excess inventory today....student opportunity tomorrow

1.8 MILLION STRONG.

133 YEARS YOUNG.

1 - 8 0 0 - 8 5 4 - C L U B



**BOYS & GIRLS CLUBS
OF AMERICA**

***The
Positive
Place
For
Kids.***

Network Edition



The latest network
products
and management
techniques

First Looks

► FAX SERVERS

Moving Closer to the Paperless Office

Are a new routing standard, lower cost, and better scalability enough?

By O. Ryan Tabibian

The paperless office might be a distant possibility, but paperless electronic faxing is a reality today. Fax servers currently offer reliable faxing to and from your networked desktop PC, with many advanced features not found on standard fax machines. Before you get rid of your fax machine, however, keep in mind that the fax-server market is still in its infancy and has yet to offer a reliable and affordable method to route incoming faxes automatically.

In our quest to shed light on the fax-server market, we reviewed four products: SofNet's FaxWorks OS/2 LAN, Version 1.39; Intel Corp.'s Net SatisFAXtion, Version 2.5.1; Traffic Software's Object Fax Advanced, Version 3.0; and Delrina

Corp.'s WinFax PRO for Networks, Version 3.0 (Version 4.0 was not available at the time of testing). In the client software category (see "When Is a Fax Not a Fax?," September 13, 1994), SofNet's FaxWorks PRO 3.0 for Windows and Delrina's WinFax PRO, Version 4.0, each won *PC Magazine's* Editors' Choice.

We selected these fax servers based on a number of criteria. We felt that, as nearly

every fax server uses some form of inbound routing to route faxes across the LAN, these products should offer direct inward dialing (DID), the most effective method today. The ability to send and receive faxes across multiple lines is also a must, particularly if you send to lots of sites. Such a load can tax most clients, not to mention the security issues associated with faxes. Because we didn't want to sacrifice a low entry cost, we looked at fax servers that use a standard PC and not a proprietary platform.

Each product here offers a unique set of features. Leading the way with its flexibility and expandability is Traffic Software's Object Fax, the winner of our Network Edition Editors' Choice. Both Intel's Net
Continues on page NE5

INDEX

First Looks

CorStream 1.0.....NE16
SnapLAN.....NE18
Lotus Notes ViP for Windows 1.0.....NE22

New & Improved

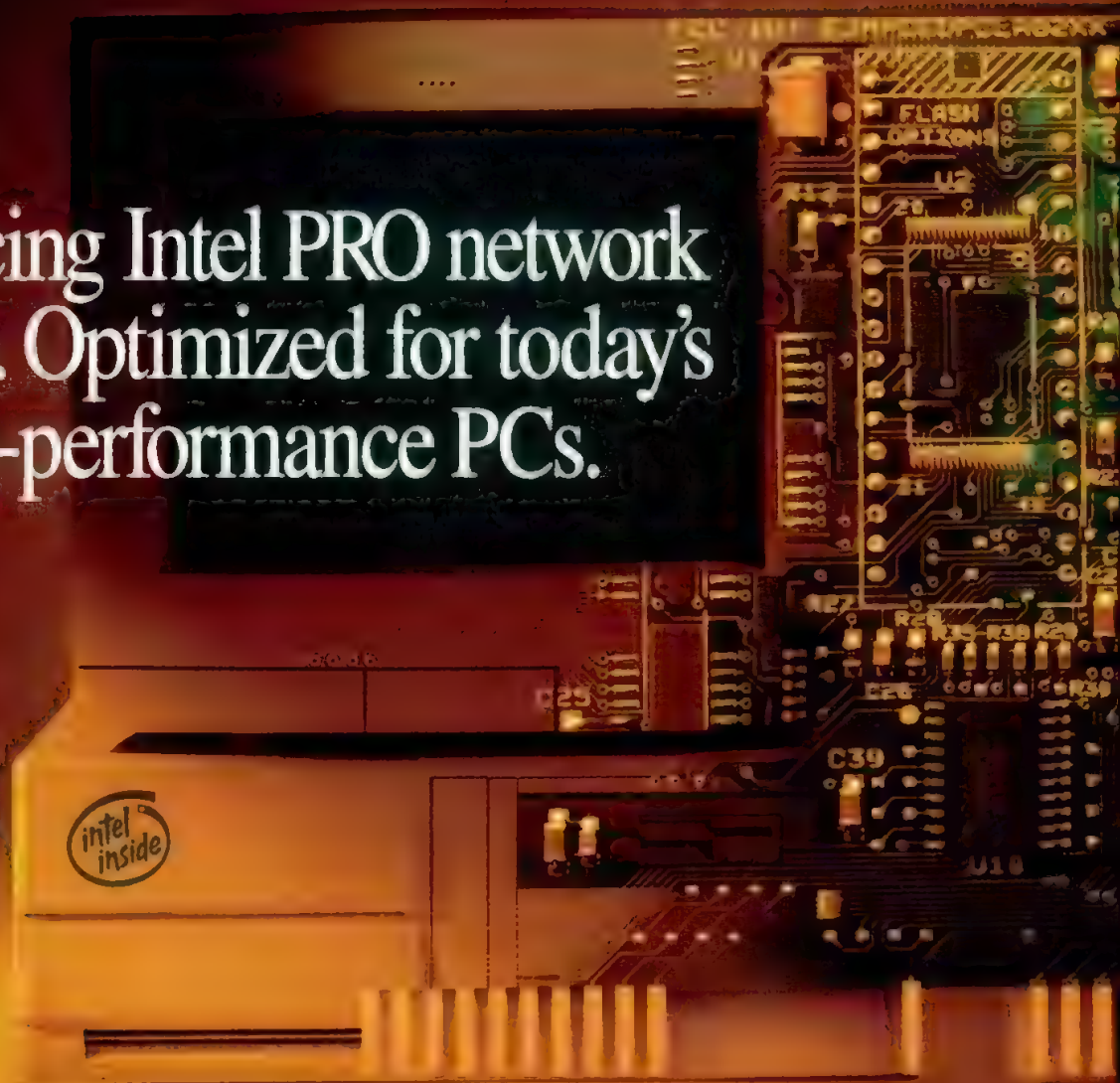
PowerHub 7000.....NE25
Annex Software, Release 9.0.....NE25
LanRover 3.0.....NE25

Channels 1.1.....NE27
CruiseLAN series.....NE27
FastGroup 8000; FastBridge.....NE27
POWERfusion 2.2.....NE28
ThunderLAN.....NE28
Virtual On-site Technology.....NE28

Derfler & Greenfield

When Companies Collide.....NE31

Introducing Intel PRO network adapters. Optimized for today's high-performance PCs.



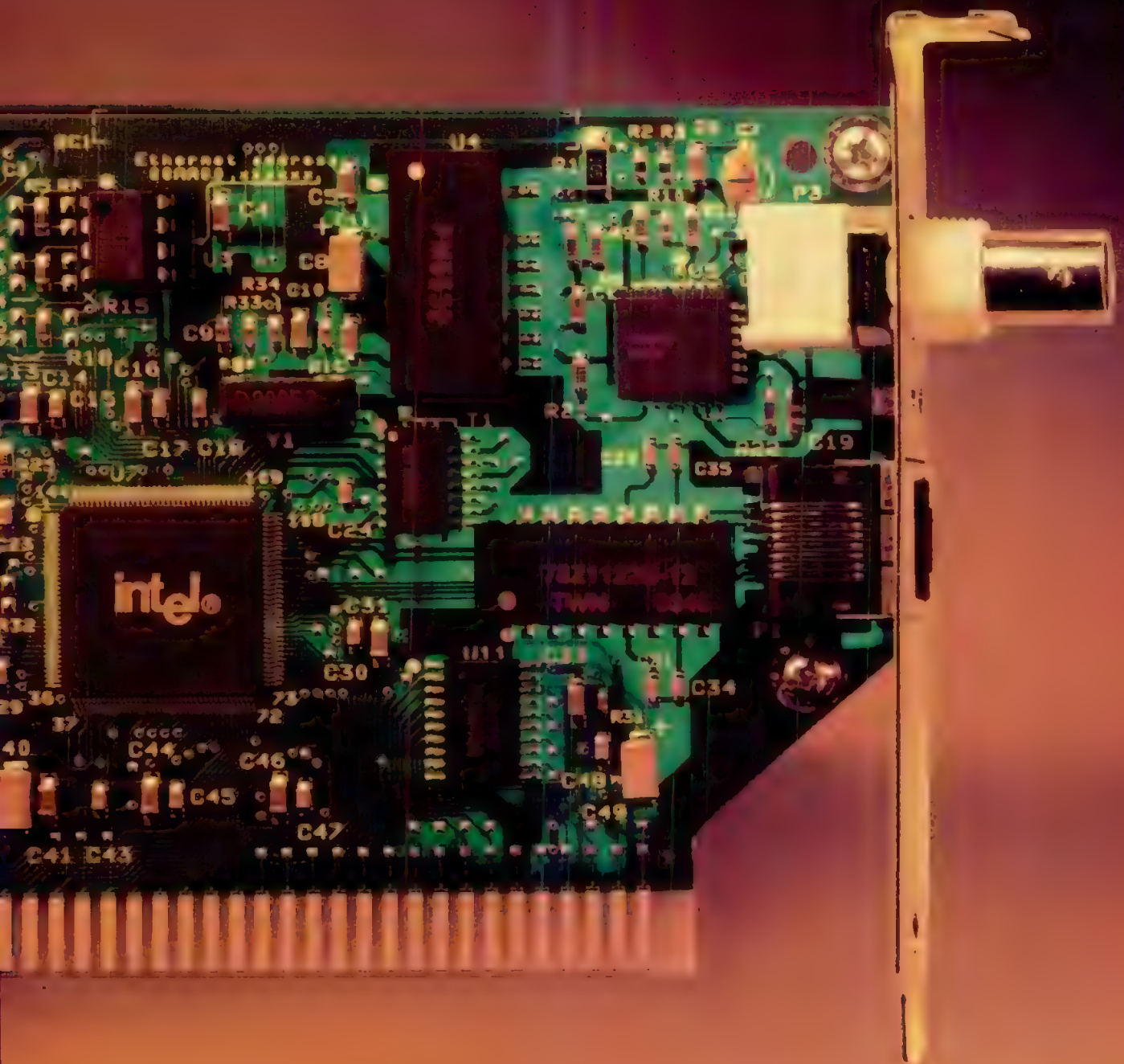
NEW INTEL PRO NETWORK ADAPTERS
are uniquely designed for Intel486™ and
Pentium™ processor-based PCs.



*They optimize PC LAN performance
with large 32kByte buffers, 32-bit drivers
and Concurrent Processing.*



*They fit major environments,
including new 10/100Mbps Fast
Ethernet and 10Mbps Ethernet.
Plus, they're DMI-ready.*



Many come with management tools,
like auto-sensing installation,
centralized driver update and pre-boot
virus protection.



1-800-538-3373

Call ext. 1313 to qualify for a special trial price,
or to receive a free demo disk. Or call FaxBack® at
1-800-525-3019 and request document #8625.

INTEL. WE PUT YOU IN CONTROL OF YOUR NETWORK.

CIRCLE 882 ON READER SERVICE CARD

intel®

Fax Servers

CONTINUED FROM NE1

SatisFAXtion and SofNet's FaxWorks were close behind. Delrina, represented for its dominance in the fax client-software market, surprised us with a poorly designed server that does little more than let multiple clients share fax boards on a dedicated PC.



• Object Fax Advanced, Version 3.0

There were a number of distinguishing factors in Traffic Software's Object Fax Advanced, Version 3.0, our Network Edition Editors' Choice. Object Fax was the only product here to offer a compre-

HOW THE FAX DOES

There are two basic types of computer-based faxing software: desktop and network. Desktop fax software is popular for faxing from your PC. Standalone fax software, however, is not as efficient as fax servers for groups of users, since it requires each user's PC to have a phone line and fax modem. Fax servers, on the other hand, let you share these fax boards and phone lines among several users. With fax servers you can send broadcast faxes, queue and schedule faxes on the server, and receive faxes directly at your PC. You can also attach ASCII files to be sent to other fax servers, a process all of these products support.

Along with server code, fax servers use client software to send faxes. Each of these products offers a standalone package to send and receive faxes. Each lets you send faxes from any application by allowing the fax server to emulate a printer and then print the fax. In either case, the file is then sent to the server where it is converted from its original format (text or visual) to a TIFF image that the fax server can transmit—a process known as rasterization.

WHAT TO CONSIDER

Given that you want to install a fax server, how do you decide which fax server is best? First, consider the amount of faxing you will be doing and the level of sending and receiving functionality you expect. Here you need to think about broadcasting, queuing, rasterization, and scalability.

When you start sending faxes to multiple recipients, a practice called broadcasting, other features become even more important. In our testing we found that broadcasting was supported equally by all of the products. Queuing, a function supported by all of these fax servers except WinFax PRO, lets you reduce fax transmission costs by storing and sched-

ulding your faxes on the server so they can be sent during off-peak hours. If you embark on large-scale faxing, scalability—the maximum number of phone lines supported—becomes critical. Multiline support ranges from four lines for WinFax PRO to 32 lines for Object Fax. To support more than four lines you will need to invest in a fax board, such as Gamma-Link's GammaFax, that integrates multiple fax modems on a single board.

A close second, Intel's Net SatisFAXtion, Version 2.5.1, also offers a solid overall solution, making it worthy of an honorable mention. It's the easi-

est to install and master and offers a good combination of features, but it is limited by its lack of support for fax boards other than its own.

SofNet's FaxWorks OS/2 LAN offers excellent client software and one of the best graphical user interfaces, along with Delrina's WinFax PRO for Networks. On the server side, FaxWorks is the only product to offer an OS/2 solution, taking advantage of a 32-bit multithreaded operating system. The product, however, is difficult to install. WinFax PRO is strong on the client side, but it offered a disappointing server solution.

able and inconvenient methods of routing, at best. One promising technology is T.30, but unfortunately only one product in our roundup, Traffic's Object Fax, supports this feature (See: "Glossary: Inbound Routing Methods"). E-mail support is currently limited: None of the products offer automated inbound routing of faxes to e-mail.

Price needs to be factored into the equation, but not the list price per se. Over time the cost of phone calls, maintenance, and support outweighs any hardware cost. What you do need to consider is the entry cost: Just how much you'll need to spend to get into faxing. Currently there are two types of fax servers: software based and hardware based. Software-based servers require a dedicated PC, network adapter, and fax boards, as well as some technical savvy for installation and configuration. The initial cost of a fax server can run upwards of \$10,000 including the cost of software, hardware, DID, and phone installation.

These products tend to carry their own installation problems, particularly when you're configuring multiple fax boards or adding users to the server. For example, to install multiple Intel SatisFAXtion fax

Continues on page NE6

**AT LAST. ALL THE POWER OF ORACLE
IN A VERSION ANYONE CAN HANDLE.**



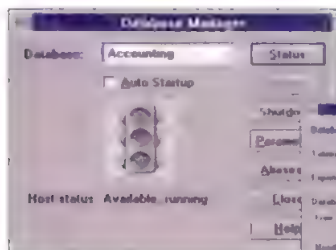
ORACLE WORKGROUP SERVER: REALLY, REALLY SIMPLE YET VERY, VERY POWERFUL.

Oracle Workgroup Server eliminates SQL database complexity and replaces it with point and click simplicity. Pretuned and preconfigured for results right out of the box, Oracle Workgroup Server is the ideal database for Workgroups from two to twenty-five. Best of all, it's 100% compatible with all

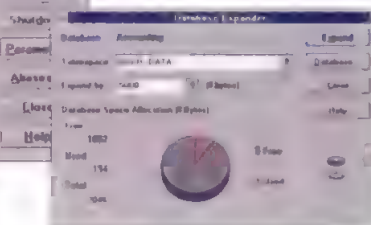
\$995
2-USER VERSION

of your favorite Windows development

tools and applications. With a powerful array of new graphical administration tools and the blistering speed and infinite scalability of Oracle7, (PC MAG. Editors Choice) Oracle Workgroup Server delivers what our competitors can only promise. For a free informational video, call 1-800-633-0518 ext 4440.



Friendly graphics indicate systems status.



Simple checkboxes & pick lists make administration easy.

ORACLE

Fax Servers

CONTINUED FROM NE5

boards we had to configure each board individually with the appropriate I/O address, since they are shipped from the factory with identical I/O addresses.

There are also hardware-based alternatives from Castelle and U.S. Robotics that integrate all of these components in one box, providing a complete plug-and-play solution. Hardware-based products typically cost more than their software-based counterparts, but if ease of installation is important, you might want to consider spending the extra money.

Management is another factor to consider. Since faxing is mission-critical to most companies, features such as server and queue status, reporting capabilities such as detailed cost-analysis reports, and alarms are recommended.

Paperless faxing cannot realize its true potential until a cost-effective inbound routing method, such as T.30, is adopted by the industry. In the meantime, you should certainly take advantage of the wealth of features that a fax server has to offer. And hold on to that old fax machine of yours. It's not going away anytime soon.

SofNet Inc.

• FaxWorks OS/2 LAN, Version 1.39

If you're looking for a multiplatform product that supports DOS, Microsoft Win-

Suitability to Task:

Fax Servers

Send The majority of your desktop faxing involves sending faxes. It is important that the client software offers an easy-to-use interface, printer driver features that let you fax from applications, and confirmations for both successful and failed transmission. The ability to attach ASCII files is also important.

Receive Methods of receiving faxes are integral to a fax server. The most important thing to look for is the type of inbound routing offered. There are a variety of methods to choose from, including direct inward dialing (DID), dual tone multifrequency (DTMF), optical character recognition (OCR), and T.30. If none of these inbound routing methods seems like a feasible solution, then you will need to rely on the administrator to route faxes manually. In this case, security becomes increasingly important. Also, look for Vendor Independent Messag-

ing (VIM) and Microsoft Windows Messaging API (MAPI) support and the ability to forward faxes to e-mail

Management Solid management is key to any networked device, including fax servers. We look for reporting capabilities, such as the percentage of time that the fax server is busy, and live monitoring of the fax server's status. When problems arise, the ability to send alarms to the fax manager is key.

Installation Here we evaluate the ease of installation as well as the technical prowess required for installation. While installation might

SUITABILITY TO TASK

Product Name

Send	POOR
Receive	FAIR
Management	GOOD
Installation	EXCELLENT

not be the most important factor in choosing a fax server, it does warrant attention. Successful installation of a software-based fax server requires that its hardware counterparts, such as the fax modem, LAN adapter, and the software, all work in perfect harmony. Well organized and detailed documentation is also a plus.

dows, and OS/2 clients, SofNet's FaxWorks OS/2 LAN, Version 1.39, would be your only choice. But while the product offers excellent, easy-to-use client software with an intuitive interface and full-featured server functions, it is hampered by a difficult installation routine and poorly organized documentation.

In addition to the multiplatform client software, the product's server software runs independent of a NOS, such as NetWare. The fax server consists of two parts: the fax Redirector (which tracks users and incom-

ing and outgoing faxes) and the configuration menu for configuring the fax server and checking its status.

SofNet's client software has strong sending features with the best notification capabilities of the products we tested. It also offers prioritization and broadcast features.

Users can take advantage of DID, DTMF, and OCR for routing inbound faxes. Manual routing of faxes, using the client software, is your best receiving method for now. Once a fax is received, the

supervisor is notified and can forward the fax to the appropriate user. For security reasons, the supervisor can only view the cover page—a feature which all of these products provide.

Management features, such as tracking server and queue status and number of faxes sent and received, takes place at the server console. (The rest of the products perform management at the client workstation.) As for reporting, you get only log files that show the number of faxes sent.

Continues on page NE8

■ Glossary: Inbound Routing Methods

CSID Call subscriber identification; a limited but popular inbound-routing method.

Since most machines transmit a CSID number at each connection, a particular number can be assigned to a specific person.

DID Direct inward dialing; an inbound routing method that assigns an individual extension to each person. DID requires the purchase of trunk numbers from the phone company, which can then be assigned to users. The sender transmits each fax to the appropriate extension.

DTMF Dual tone multifrequency; an inbound routing method that requires the sender to enter a specific code on the fax machine

after the normal handshake. Once the code is entered, the fax machine on the other end can decipher the code as a handshake.

OCR Optical character recognition; a technology that translates images of printed characters into text. Using OCR, the server converts the fax image to text, reads the name of the recipient, and routes the fax appropriately. Since OCR is still not very reliable, it is one of the least used methods of inbound routing.

T.30 An inbound routing method that, like the DTMF method, requires a code to be entered by the sender after dialing. With T.30, the code is a number followed by the pound sign.

INSTANT FAXING FOR NETWARE USERS.



If you're

ready for

computer-

based faxing, remember

our simple recipe. Don't

bother adding a dedicated

workstation; instead just

add Cheyenne FAXserve™ to

any NetWare 3.1X or 4.0 server.

Then enjoy a perfect blend of

robust performance, air-tight

security, and hassle-free manage-

ment. You can stir FAXserve right

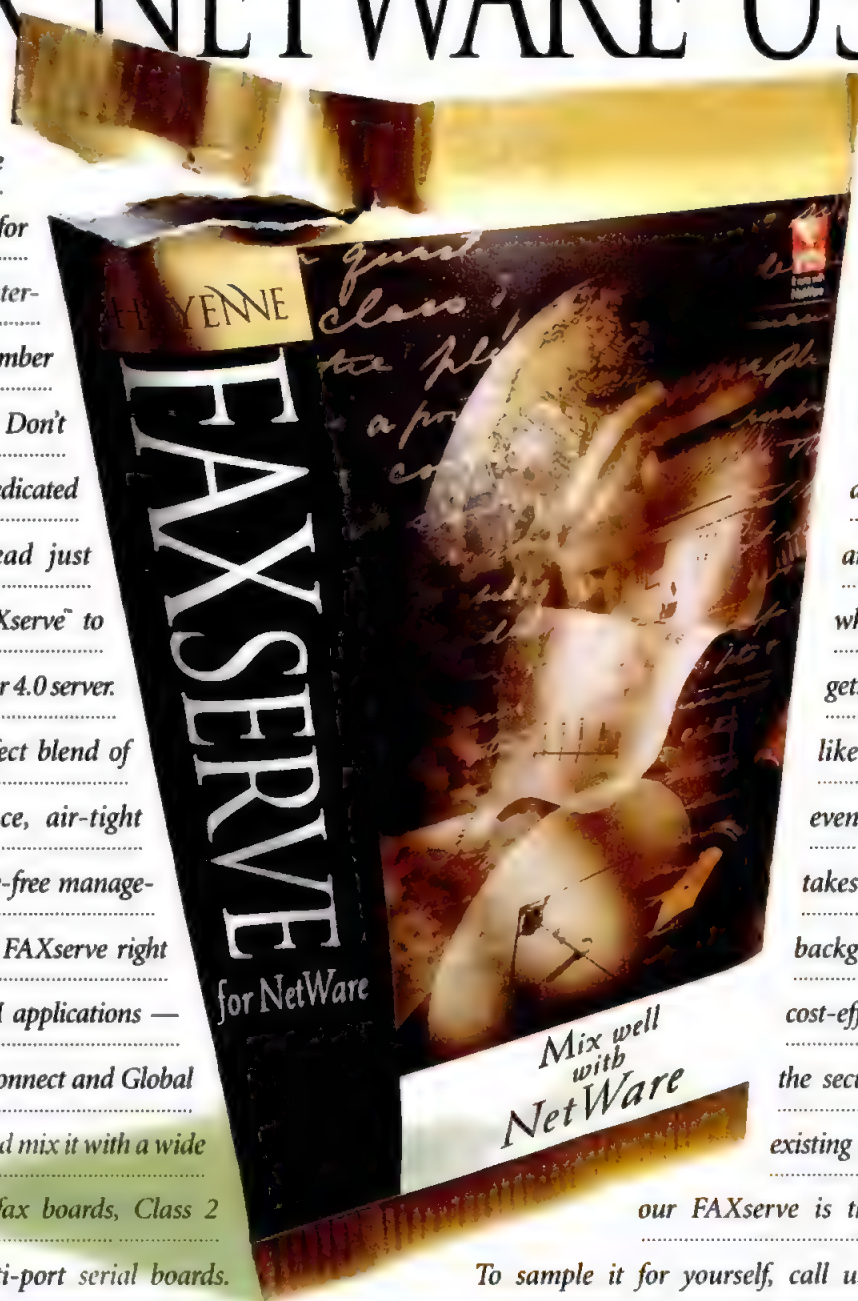
in with other NLM applications —

such as NetWare Connect and Global

MHS E-mail — and mix it with a wide

range of certified fax boards, Class 2

modems and multi-port serial boards.



With FAXserve, users

can fax from within

any DOS, Windows, or

MHS E-Mail-compliant

application. It's as easy

as preparing a document

and defining who gets it,

where it goes, and when it

gets sent. Everything else —

like monitoring, queuing,

even automatic redialing —

takes place entirely in the

background. So for simple,

cost-effective fax services within

the secure environment of your

existing Novell operating system,

our FAXserve is the essential ingredient.

To sample it for yourself, call us at 1-800-243-9462*

CHEYENNE
COMMUNICATIONS

FAXserve is a trademark of Cheyenne Communications, Inc. in the U.S., a wholly-owned subsidiary of Cheyenne Software, Inc. Cheyenne is a registered trademark of Cheyenne Software, Inc. All other trademarks or registered trademarks are the properties of their respective holders. ©1994 Cheyenne Software, Inc. All rights reserved. *Outside North America, please dial (516)484-5110.

CIRCLE 868 ON READER SERVICE CARD

Fax Servers

CONTINUED FROM NE6

Many of our installation problems can be attributed to difficulties in configuring devices such as the GammaFax board in OS/2. Other problems occurred when configuring users in the Redirector. These problems were resolved with some help from SofNet's technical support. Installation of the client software was simple and intuitive.

Overall, SofNet offers an advanced fax

SUITABILITY TO TASK

**FaxWorks OS/2 LAN,
Version 1.30**

Send **GOOD**

Receive **GOOD**

Management **FAIR**

Installation **FAIR**

client interfaces and is the only product that runs on a 32-bit multitasking operating system.

server that, while potentially difficult to install and configure, should be on your list of viable candidates. Of the fax servers we reviewed, FaxWorks features one of the best

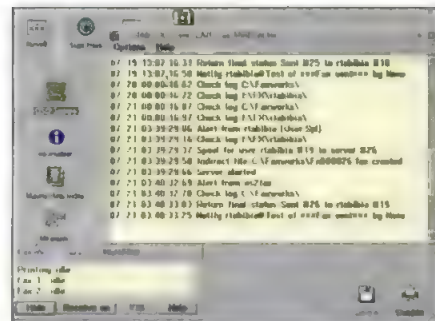
SUMMARY OF FEATURES

Fax Servers

Products listed in alphabetical order
■ = YES □ = NO

	FaxWorks OS/2 LAN, Version 1.30	Net SatisFAXtion, Version 2.5.1	Object Fax Advanced, Version 3.0	WinFax PRO for Networks, Version 4.0
List price	\$699 (10 users)	\$1,195 (25 users)	\$980 (25 users)	\$399 (2 clients, 1 server)
Server platform	OS/2	DOS	DOS, Windows	DOS
Works with dedicated/non-dedicated PC	■	■	■	■
Maximum number of fax modems supported	32	8	32	4
Fax modems supported	BrookTrout, GammaLink, Intel	Intel SatisFAXtion	BrookTrout, GammaLink, Pure Data	All
Fax classes supported	1, 2	1, 2	1, 2, CAS	1, 2
Supports retransmission on client	■	■	■	■
Supports queuing on server	■	■	■	■
Send and Receive Features				
Private and public address books	■	■	■	■
Delete	■	■	■	■
Forward	■	■	■	■
Notify	■	■	■	■
Store in managed in-box	■	■	■	■
View cover page	■	■	■	■
View entire fax	■	■	■	■
Inbound Routing Supported				
CID	■	■	■	■
DID	■	■	■	■
DTMF	■	■	■	■
OCR	■	■	■	■
T.30	■	■	■	■
Client Operating Systems Supported				
DOS	■	■	■	■
Microsoft Windows, Version 3.1	■	■	■	■
OS/2, Version 2.1	■	■	■	■
Macintosh	■	■	■	■
NOSs Supported				
NetWare 3.x	■	■	■	■
Microsoft Windows for Workgroups	■	■	■	■
Microsoft Windows NT	■	■	■	■
OS/2 LAN Server	■	■	■	■
VINES (VinesIP)	■	■	■	■
Send Transport Mechanisms Supported by Client				
E-mail	■	■	■	■
Print driver	■	■	■	■
Vendor-provided application	■	■	■	■
Receive Transport Mechanisms Supported by Client				
E-mail	■	■ (through manual routing)	■ (through manual routing)	■
Vendor-provided application	■	■	■	■

PC MAGAZINE
NETWORK EDITION
EDITORS' CHOICE



WHAT'S FAXING: FaxWorks' Redirector tracks incoming and outgoing faxes.

FaxWorks OS/2 LAN, Version 1.30.

List price: \$699 (10 users). SofNet Inc., 1110 Northchase Pkwy., #150, Marietta, GA 30067; 404-984-8088.

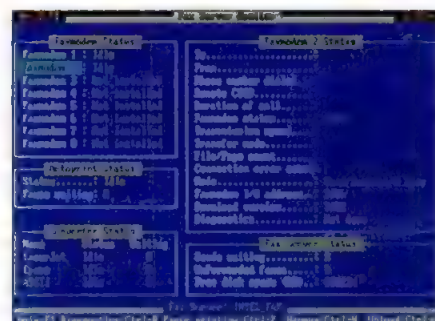
Circle 962 on reader service card

Intel Corp.

Net SatisFAXtion, Version 2.5.1

Intel's Net SatisFAXtion is an invigorating product and was, in fact, a serious contender for our Network Edition Editors' Choice award. The product's intuitive installation program, along with its clear and well-organized documentation, simplified both installation and configuration.

Sending faxes from your PC is a breeze. The client portion of the software



SERVER STATS: Net SatisFAXtion's server console tracks the status of each fax board.

features an easy-to-use interface and prioritization and confirmation support.

Net SatisFAXtion supports some standard receiving features, including inbound routing methods such as DID, DTMF, and OCR. If you plan on implementing manual routing, take advantage of an Intel security feature that limits the

Continues on page NE11

Hot Wax and Jet Sprays Have Their Place. But Not In Quality Color Printing.



Introducing the world's only true 600x600 dpi desktop color laser printer.

The QMS® *magicolor* Laser Printer gives you output resolution that's twice that of enhanced color inkjet and thermal wax transfer. Fast and networkable, the QMS *magicolor*™ Laser Printer also offers extremely low consumable usage and cost unmatched by any other printer in its price range, with new features for even less money. Here's your chance to polish your image. For more information on how the QMS *magicolor* Laser Printer can make your work shine or the ColorSpecialist nearest you, Call 800 972-6708 Dept. 4020.



QMS

For service on QMS and other products, call
800 762-8894 (U.S.) • Q-Fax 800 633-7213
E-mail: info@qms.com • Canada 800 263-5508

CIRCLE 884 ON READER SERVICE CARD

QMS Reference Price: QMS ColorScript Laser 1000 \$7,999 • QMS *magicolor* Laser Printer 12 MB \$9,999 • QMS *magicolor* Laser Printer 28 MB \$10,999
QMS, the QMS logo and *magicolor* are trademarks or registered trademarks of QMS, Inc. One Magnum Pass, Mobile, AL 36618, 205 633-4300



The Fastest. No Buts About It.

These guys are going nowhere fast. So they may not care that **CoSession™ for Windows** is the fastest remote control software or that it has the most features and best support...but you might.

Remote communications is all we do. That's why we do it best. As the first product to provide remote control and remote access for Windows, you get all you need in a remote communications software and more.

So, if you want the fastest remote control and remote access software for Windows, give us a call at **800-322-9440**. We're the company that does it best...no ifs, ands or butts.

Kick butt remote control software for Windows.



Triton Technologies, Inc., 200 Middlesex Turnpike, Iselin, NJ 08830 • 908-855-9440 • Fax: 908-855-9608

CIRCLE 892 ON READER SERVICE CARD



Fax Servers

CONTINUED FROM NE8

administrator's view to the cover page.

Management is one of Net SatisFAXtion's strong points. Management takes place only on the client workstation; the server console can be used only to view the status of each fax board. In its favor, Net SatisFAXtion was the only product here to offer SNMP management via a management platform—Intel's own LANDesk software. Other management features include cost-analysis reports and an activity report that keeps the administrator abreast of the status of the server.

The fax server's installation program provided automatic detection of fax boards, and both the modems and the software were configured automatically. If you

are planning to install more than one Intel Net SatisFAXtion card, you need to configure each card individually with the correct I/O address. Every card is shipped from the factory with the same I/O address, which can cause conflicts.

Intel's Net SatisFAXtion is a solid product. Support for T.30 and other fax modems would have made this product hard to beat.

► **Net SatisFAXtion, Version 2.5.1.** List price: \$1,195 (25 users). Intel Corp., 5200 North East Elam Young Pkwy., Hillsboro, OR 97124; 800-538-3373.

Circle 963 on reader service card

NETWORK EDITION

EDITORS' CHOICE

Traffic Software Inc.

• **ObjectFax Advanced, Version 3.0**

Traffic Software's Object Fax Advanced might be the least-known product in this review, but surprisingly, it has features not found in any other package we looked at. The fax server offers an excellent user

interface, easy server installation, and support for most inbound routing methods. All of these features contributed to our choosing Object Fax as our Network Edition Editors' Choice.

Object Fax offers the best set of sending features here. The client software consists of a Microsoft Windows-based application and a printer-emulation driver. Traffic offers a well-designed floating toolbar, the Traffic Object Manager (TOM), for accessing the application on the client. You can also check on the server status and view the server queue. Object Fax supports OLE 2.0, which means you can take any OLE 2.0-compliant document (such as a Microsoft Excel spreadsheet) and drag-and-drop it onto TOM for faxing. This feature is not offered by any other network product.

The client software also offers such basic features as queuing, broadcasting, and fax prioritization. Rasterization is very slow, placing Object Fax third among the products we reviewed.

Continues on page NE14

CHAMELEON 4.0

TCP/IP Applications for Windows

Includes WinSock TCP/IP

100% DLL

Only 6KB Base Memory

5 Minute Install

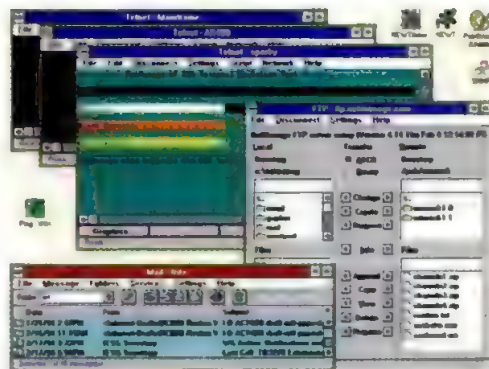
Internet Communications:
Office, Home,
Remote

24 WINDOWS APPLICATIONS, MORE THAN ANY OTHER TCP/IP PACKAGE.

APPLICATIONS Telnet (VT100, VT220, TVI), TN3270, TN5250, FTP (client & server), NFS (client & server), SMTP Mail with MIME, NewsReader, PROFS Mail, LPR/LPD, Gopher, Phonetag, Ping, Finger, BIND, Whois, Scripting, Statistics, Custom, TFTP, SNMP Agent, and more.

TERMINAL EMULATION Advanced features include scalable fonts, scripting, button pad, screen capture, drag-and-drop keyboard remapping and printing. **INTERNET ACCESS** Easy point-and-click access to the resources of the Internet.

Read and post to news groups, download software or documents and search gopher space. **NFS** First ever client and server for Windows provides transparent file and printer sharing (ask for Chameleon/NFS). **MAIL** Internet SMTP Mail with folders, rules and MIME multi-media attachments. **DEVELOPER TOOLS** Windows Sockets API; ONC RPC/XDR; WinSNMP, FTP, SMTP APIs, Visual Basic support and more.



NETMANAGE™
(408) 973-7171

10725 North De Anza Boulevard
Cupertino, California 95014, U.S.A.
Fax: (408) 257-6405



May 1993

CIRCLE 877 ON READER SERVICE CARD

WE'RE TALKING AIR-TIGHT VIRUS PROTECTION HERE.



We mean what we say.

Cheyenne InocuLAN® puts a tight seal on both your servers and your workstations, guarding your entire network from viruses. In other words, we're not talking about another workstation-based or server-only product offering limited protection. We're talking about a complete NCSA-certified anti-virus solution that places a secure cover around all the potential points of infection. InocuLAN integrates a centrally administered server module that scans for viruses at



user-defined intervals and traps viruses in real-time whenever they attempt to enter or exit. It also includes a workstation module that scans individual hard disks and floppies.

Then it blows the whistle at the first sign of boot, file, multi-partite, stealth, and polymorphic viruses. Even the offer is air tight: order now and get a



free copy of Cheyenne V-BASE®, our comprehensive hypertext anti-virus encyclopedia. Enough talk. Call us at 1-800-243-9462. And put the wraps on viruses, once and for all.*

CHEYENNE

NEW YORK · PARIS · LONDON · MUNICH · TOKYO

InocuLAN and Cheyenne are registered trademarks of Cheyenne Software, Inc. All other trademarks or registered trademarks are the properties of their respective holders. ©1994 Cheyenne Software, Inc. All rights reserved. *Outside North America, dial (516)484-5110.

CIRCLE 894 ON READER SERVICE CARD

PUT IT IN YOUR PC. PUT IT IN YOUR SERVER. PUT IT IN YOUR WILL.

With their unparalleled reliability, you can count on Proteon ProNET-4/16 Plus Token Ring adapter cards to last a lifetime...and then some. Which is exactly why we can back every one with our full Lifetime Warranty. Simply put, you can have confidence in Proteon adapter

cards, because they're an investment that leaves nothing to chance.

All ProNET Token Ring adapter cards also come backed with our 100% Interoperability Guarantee. So whether you use them in your individual PC or in your server, they're totally compatible with any network operating system, hardware environment or application software you may have up and running. Otherwise, we'll refund your money. It's the ultimate combination of dependability and award-winning performance. And

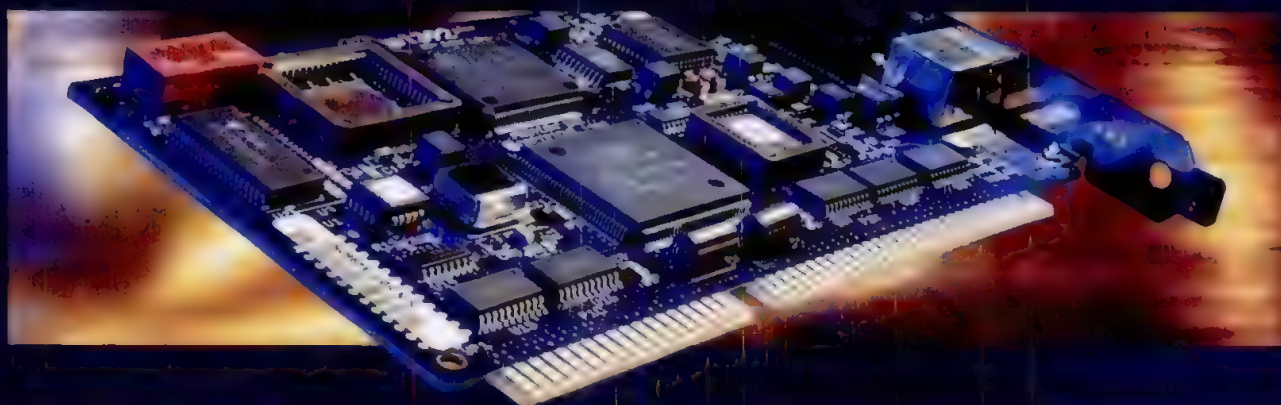
only Proteon has the technology to deliver it to you in writing.

In addition, these Proteon ProNET Token Ring adapter cards are totally software configurable, so installation is refreshingly simple. Plus, they're available for ISA, EISA and MCA architectures.

All of these features will undoubtedly add up to make your job a whole lot easier. Namely, by providing you with the most reliable and versatile Token Ring adapter card available. So call 1-800-830-1300, Dept. 400 (or fax: 508-366-8901) to get the facts on the ProNET Series cards and their unrivaled warranty/guarantee. Then look into getting a Proteon ProNet adapter card for your system. Put it in. Put it to work. And put it out of your mind.



proteon



Fax Servers

CONTINUED FROM NE11

Delrina's WinFax PRO is the slowest, and Intel's Net SatisFAXtion is the fastest.

The client portion of Object Fax is great, and the server side is equally impressive. Object Fax supports CSID,

SUITABILITY TO TASK Object Fax Advanced, Version 3.0

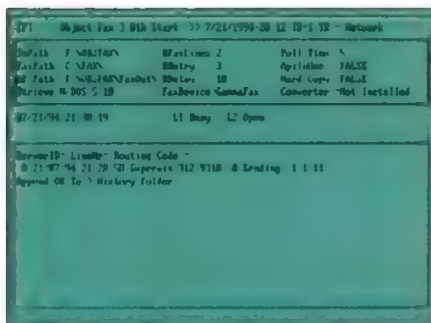
Send	EXCELLENT
Receive	GOOD
Management	GOOD
Installation	GOOD

DID, DTMF, OCR, and T.30.

On the management front, Object Fax offers a Windows-based utility to view the status of the server and the fax queue.

It also offers a detailed log of the fax server's status and problems.

Object Fax has an intuitive installation routine that, unlike Delrina's and Intel's, is NOS-independent. Still, we did experience a minor problem with the client installation: It failed to copy the correct



CHECKUP: Object Fax's management utility lets you view the server and the fax queue.

printer-emulation drivers to the Windows directory.

Object Fax offers the best overall fax-server solution of the products in this roundup. Potential buyers should, however, consider its problematic user installation before purchasing it.

► Object Fax Advanced, Version 3.0.

List price: \$990. Traffic Software Inc., 360 W. 31st St., New York, NY 10001-2793; 212-714-1584.

Circle 964 on reader service card

Delrina Corp.

• WinFax PRO for Networks, Version 3.0

Though Delrina Corp. offers one of the best standalone client-software solutions, its fax server, WinFax PRO for Networks, Version 3.0, leaves a lot to be desired.

If you are familiar with Delrina's standalone fax software, you should have little problem sending faxes to the server software—the products are almost identical. The main difference is that you configure the client to use the fax boards on the server instead of using fax modems locally. The client software offers prioritization and attaching of files but does not support queuing of faxes on the server. You can broadcast faxes, but your workstation will be bogged down with rasterization and sending. Since none of these processes take place on the server, WinFax PRO is somewhat inefficient; the other products in this roundup move the

Continues on page NE16

KING AMONG PEERS

POWERLan 3.0: The Most POWERful Peer-to-Peer LAN Operating System

Click a mouse four times and key in your name. That's all it takes to install POWERLan. But the sleek, animated interface is just the beginning.

Grows with You

Comfortably add users while you mix and match Windows and DOS. As you grow, enjoy true peer-to-peer and client/server flexibility in any combination.

Strongest Peer Platform

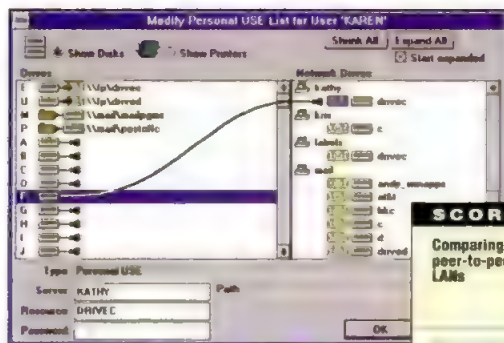
POWERLan's multi-tasking, dedicated server provides the capacity and horsepower for your performance-critical applications.

Designed to Standards

Built to Microsoft/IBM standards, POWERLan speaks the same protocols as networks such as WFW, NT, and IBM LAN Server—complementing these environments where needed.

Incredibly Easy to Manage

Superior user and group handling, single-logout to the entire network, remote admin, and mainframe-style printing—all contribute to POWERLan's easy setup and administration for small or large sites.



Now connecting resources is plug and play—literally!



"POWERLan's combination of ease of use, solid performance, and strong management features will appeal to many small to medium-sized sites looking to connect their stand-alone computers."

PC Week
February 7, 1994

SCOREBOARD					
Comparing peer-to-peer LANs	PCWEEK LABS REVIEW	Artisoft Inc. Simply LANtastic 5.1	Microsoft Corp. Windows for Work- groups 3.11	Novell Inc. Personal NetWare 1.1	Performance Technology Inc. PowerLan 3.0 for Windows
PCWEEK LABS Overall score		3.2	3.5	3.5	4.0



800-443-LANS

Performance Technology
800 Lincoln Center
7800 IH-10 West
San Antonio, Texas 78230

PERFORMANCE TECHNOLOGY

CIRCLE 867 ON READER SERVICE CARD

THE FASTEST WAY TO GET WHAT YOU WANT.

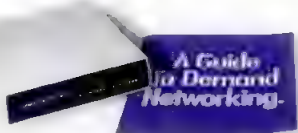
Our **on-demand networking** products let you access a **2 MB file** on your **enterprise network** from anywhere in **less than a minute**. Without the cost of a dedicated line. An **analog modem** would take from **12 minutes to an hour**, even with data compression.

If you've tried to access a corporate network from a remote office or from home, you know that operating complex applications via modem is like trying to run the 100-yard dash through waist-deep mud. Only Combinet's Everywhere Networking™ lets you access any file or application on your enterprise network through the telephone network without paying a heavy price in time or dollars. You can easily access information-intensive applications like Windows™ and imaging from any location, just as if your PC, Mac®, Unix® workstation, or X-terminal was hard-wired to the enterprise network. No complex log-in procedures.

No time-consuming waits for large file transfers. Our "Guide To On-Demand Networking"

explains all the benefits of Everywhere Networking and our low-cost, easy-installation on-demand network solutions.

Call today for your free copy.



1-800-967-6651

CIRCLE 872 ON READER SERVICE CARD



EVERYWHERE NETWORKING. The Fastest Way To Get What You Want.

© 1994, Combinet, Inc. Combinet and Everywhere Networking are trademarks of Combinet, Inc. All other trademarks are property of their respective owners. Combinet, Inc. 333 W. El Camino Real, Sunnyvale, CA 94087.

SEE US AT NETWORK & INTEROP ATLANTA BOOTH #4566

Fax Servers

CONTINUED FROM NE14

faxes to the server for broadcasting.

There are few options when it comes to receiving faxes. WinFax PRO forwards faxes to the supervisor's workstation, a process that can be time-consuming and can also bog down the machine. All of the other products receive the faxes on the server and then notify the supervisor that there is a fax waiting to be forwarded—a much more efficient solution. The server supports DID, DTMF, and OCR.

There is also very limited management. It consists of a client utility that monitors the status of each modem.

WinFax PRO requires a 90K TSR



MODEM MONITOR: WinFax PRO for Networks manages modem status.

when run as a nondedicated server. It offers limited configuration utilities that run on any Windows client equipped with fax boards. Installation is intuitive and requires little feedback from the user.

SUITABILITY TO TASK

WinFax PRO for Networks, Version 3.0

Send	FAIR
Receive	POOR
Management	FAIR
Installation	GOOD

► **WinFax PRO for Networks, Version 3.0.** List price: \$399 (2 clients, 1 server). Delrina Corp., 895 Don Mills Rd., 500-2 Park Center, Toronto, ON, CD M3C 1W3; 800-268-6082.

Circle 965 on reader service card

O. RYAN TABIBIAN is a technical analyst for PC Magazine Network Edition.

► HIGH-POWERED PEER-TO-PEER

CorStream: The Perfect Union Of LANtastic and NetWare?

BY STEVE RIGNEY AND JEFFREY D. BAHER

Looking to improve the performance of your LANtastic network? Artisoft's new CorStream, Version 1.0, can help: It's a 32-bit dedicated server that runs as an NLM on top of NetWare 4.01, bringing the power of NetWare to LANtastic and allowing larger, more robust LANtastic networks. Although LANtastic 6.0 clients can already attach to NetWare 3.12, CorStream is far more effective at maintaining LANtastic's ease of use and administration. Of course, whether you go with CorStream or NetWare 3.12, you're going to suffer through a lengthy installation.

Although LANtastic is typically considered a workgroup solution, we know of several LANtastic network sites that support well over 100 clients. These are the sites that stand to benefit most from CorStream. In our experience, LANtastic networks typically run out of gas when there are about 10 active clients and no dedicated server. With a dedicated server, the network can usually support between 15 and 20 active clients, depending of course on the applications that are running.

CorStream (\$1,149, with a 5-user copy of LANtastic 6.0) provides the boost these networks need. It runs as an NLM

on a NetWare 4.01 server, which can be accessed not only by LANtastic 5.0 and 6.0 clients, but also by NetWare 4.01 clients. A streamlined, runtime version of NetWare 4.01 is included with CorStream, along with a two-user, full-featured version. The runtime version of NetWare 4.01 doesn't provide the enterprise-wide features that distinguish it from NetWare 3.x, such as NetWare Domain Service (NDS) support.

The CorStream NLM works by intercepting and converting LANtastic packets into NetWare service requests. So NetWare drives and printers become available to LANtastic clients, but the NetWare 4.01 server handles all the requests to access them. Because of this conversion process, CorStream cannot perform quite as fast as a native NetWare 4.01 server. But we didn't notice any significant difference during

our tests.

Before CorStream, you could set up a dedicated server with LANtastic in one of two ways: Configure a LANtastic client that no one actually uses, which will provide significant performance gains but still limits you to a 16-bit DOS server, or attach a LANtastic 6.0 workgroup to a NetWare 3.x network and take full advantage

of LANtastic's universal client (see Network Edition, First Looks, May 31, 1994) and NetWare's 32-bit OS. Integrating LANtastic 6.0 with NetWare

Continues on page NE18

► FACT FILE

CorStream, Version 1.0

List price: For five users, \$949.99; For five users with a five-user version of LANtastic 6.0, \$1,149

In Short: Artisoft's CorStream augments the ease of use of LANtastic 5.0 and 6.0 networks with the power of a NetWare 4.01 dedicated server. It runs as an NLM and provides solid performance along with most of NetWare 4.01's basic features to LANtastic clients. Integrating LANtastic 6.0 with NetWare 3.12 can deliver better overall performance at a slightly lower cost, but it requires an add-on to support LANtastic 5.0 clients and can impose considerable administrative burdens on LANtastic users.

Artisoft Inc., 2202 N. Forbes Blvd., Tucson, AZ 85745, 602-670-7100, fax: 602-670-7101.

961 on reader service card



With our new PCI-to-Fast SCSI model, this is considered standard equipment.

When your data is driving at speeds like this, make sure your I/O is safely keeping pace. That's why you'll want the new Adaptec® AHA®-2940 family of host adapters.

Under the hood is a souped-up version of our PhaseEngine® RISC processor, allowing the AHA-2940 to maximize system I/O performance and utilize the PCI local-bus to

transfer data up to 133 MB/second. But, how valuable is speed if you're on a crash course? The AHA-2940 passes every safety check. It's 100% PCI 2.0-compliant today and is tested with all major PCI hardware and peripherals as soon as they're released. And, like all Adaptec IOWare® products, the AHA-2940 and the PCI SCSI Master® kit offer Adaptec's superior compatibility, quality and reliability.*



When you're driving in the fast lane, make sure you have the safety equipment you need. Ask for the Adaptec PCI SCSI Master kit or the new AHA-2940 PCI family from Arrow's Commercial Systems Group. For safety and performance, we're setting a whole new standard.

adaptec®

I/O. NOW MORE IMPORTANT THAN EVER.

Artisoft Inc.

CONTINUED FROM NE16

3.12 (which costs \$1,095 for five users) can lead to significant improvements in overall network performance—better performance, in fact, than with CorStream.

CorStream, however, brings more than just a performance boost to LANtastic. Most importantly, CorStream maintains LANtastic's ease of use and simple administration while bringing most of NetWare 4.01's basic features, including disk compression, disk mirroring, and disk duplexing, to the LANtastic network. This is all done without the need for multiple protocol stacks on each client and without the need for users to log on to multiple security systems (both of which are required to integrate LANtastic 6.0 with NetWare 3.12). Another disadvantage of the NetWare 3.12 solution is that it requires an additional product, Artisoft's LANtastic for NetWare, Version 5.0 (\$499), to support LANtastic 5.0 clients.

Another point in CorStream's favor: Users can map drives via LANtastic's familiar NET utility, while the same action under NetWare 3.12 would require them to learn complicated command-line structures. Using NetWare 3.12 would also require NetWare login scripts, printer definition files, and other administrative headaches for each client.

Both CorStream and the NetWare 3.12 solution provide the ability to use hundreds of other third-party NetWare NLMs for tape backup, network management, and virus scanning on the server. More NLMs will run with NetWare 3.12, because many require the NetWare IPX protocol stack on each client.

LANtastic by itself is a breeze to install, but CorStream is definitely not. It took us several hours to get the runtime version of NetWare 4.01 loaded and con-



Benchmark Tests: Network Operating Systems

CorStream, using NetWare 4.01, lagged slightly behind than the NetWare 3.12 kernel does and leaves less available for cache.

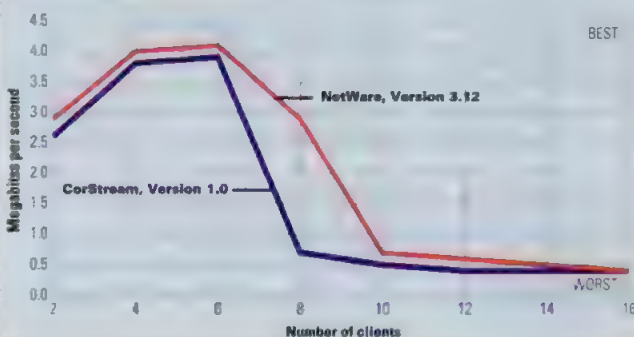
—Analysis written by Jeffrey D. Baber

On our Ethernet test-bed, we used one Compaq Systempro/XL 50 server and 16 client PCs. 14 Compaq ProLinea 4/33s and two Compaq Deskpro 486/33Ms

The I/O Throughput test from NetBench 2.10 evaluates the amount of data that a client can transfer to the server and back in 1 second. A client issues read and write requests to a file stored in the server's 1MB cache. The test uses a 4MB file and 512-byte blocks. We ran the test eight times, increasing the number of clients from 2 to 16, adding 2 clients each time.

NetWare 3.12 on virtually every stage of our test. With more than six clients, the CorStream server could no longer handle the client requests using cache memory only, and the performance dropped steadily as more disk access was required. NetWare 3.12's performance also dropped off when cache resources were exceeded, but that occurred after eight clients.

The big difference between the two NOSs is the size of the NetWare kernels: The NetWare 4.01 kernel, used by CorStream, requires more memory



figured on the server, even though it is only eight disks. The CorStream NLM, which is only one disk, loaded quickly but required us to reconfigure one of our LANtastic clients as a NetWare client.

between CorStream and NetWare 3.12 comes down to ease of use. If ease of use is absolutely vital to your organization, as it is to many LANtastic users, then CorStream is the obvious choice.

WORKGROUP HUB

The Snappable Stackable Hub

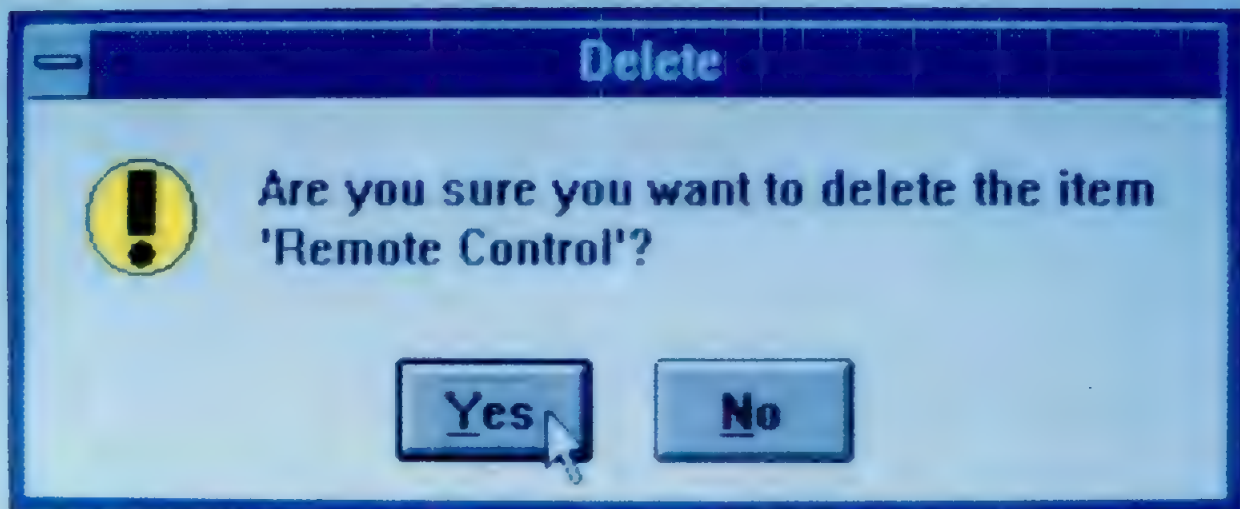
BY STEVE RIGNEY

The new SnapLAN hub, from ADC Fibermux Corp., gives an all-new meaning to the term *ease of installation*. Unlike other stackable hubs, the SnapLAN utilizes hub modules that snap into place, greatly simplifying installation and organization of the hub while eliminating the web of external cables required for connection by other stackable hubs. Managing the optional Wellfleet Com-

munications router module can be a problem, however, because it requires a Unix workstation.

The SnapLAN offers what has become the de facto standard feature set for stackable hubs: Ethernet and Token-Ring support, SNMP manageability, and routing (via Wellfleet router modules designed specifically for the SnapLAN). Also, the SnapLAN can bridge traffic between modules in the same stack. Finally, the price tag for all these features is reasonable, though not quite rock-bottom: The

Continues on page NE20



Once
you try
remote
disk,
you'll lose
control.

Remote control is a great way to access a computer by modem if there's no other option. But if you could accomplish the same thing faster and more easily, you'd probably drop it in a minute.

Which is precisely what you can do once you have HotDisk® — the amazing new remote disk software from Smith Micro for both DOS and Windows.

With HotDisk, you execute programs at your location while accessing up to 26 drives available to a host PC exactly as if they were on your own computer. As a result, you bypass the bottlenecks that bog down remote control and free the host to be used by somebody else because HotDisk operates invisibly in the background.

HotDisk is simple to use, too, since it utilizes all DOS commands — including the easy-to-use COPY command for transferring files — as well as convenient drag and drop Windows capabilities. And it gives you transfer speeds of 1,200 to 115,200 bps, plus password protection, host dial-back security and access rights for each user.

SMITHMICRO
SOFTWARE 

So call Smith Micro — the leader in telecommunication software — today at 1-800-964-SMSI for more information or to find out where you can get HotDisk.

It's the remote control alternative worth getting excited about.



ADC Fibermux Corp.

CONTINUED FROM NE18

SnapLAN will carry a price of roughly \$90 per managed Ethernet port, while 3Com Corp.'s recently introduced LinkBuilder FMS II will cost approximately \$65 per managed Ethernet port.

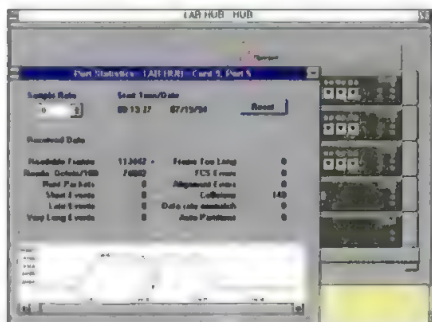
The LinkBuilder FMS II also provides more flexibility than SnapLAN does and is better suited to large network environments. For example, The LinkBuilder FMS II supports eight modules in a stack, compared with SnapLAN's five, and utilizes 24-port Ethernet modules, while SnapLAN modules offer no more than 16 ports. The LinkBuilder is managed via 3Com's Transcend applications, which run on a variety of platforms, including HP OpenView for Unix, SunConnect SunNet Manager, and IBM NetView 6000. Transcend is not available for Windows, but a DOS version is available. Despite all these features, the LinkBuilder cannot match SnapLAN's most important feature: ease of installation.

We found the SnapLAN very easy to set up and had a small, two-module stack hooked up in minutes, starting with just the power-supply module and a 16-port Ethernet module. We then expanded it to a full, five-module stack by simply attaching two additional Ethernet modules and an SNMP management module. The whole hardware setup process took less than 10 minutes.

The hub is completely SNMP-manageable via ADC Fibermux's LightWatch application, which is available for both Windows and Unix versions of HP OpenView. We tested the Windows version of LightWatch and found its interface friendly and well organized. It provides port status and control for the entire SnapLAN stack (LightWatch can also be used to manage ADC Fibermux's CrossBow hubs). We found LightWatch's graphical representation

of the SnapLAN stack especially helpful. It allowed us to select and monitor specific hub ports simply by clicking on them.

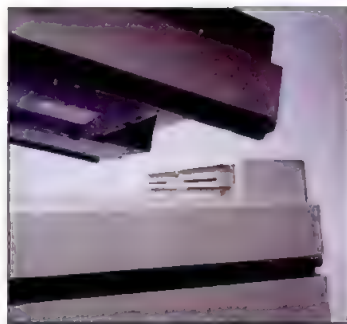
One problem we encountered with the management software was that it requires NDIS drivers, instead of the ODI drivers we were using on our test-bed. To use



HUB LIGHT: LightWatch provides a graphical view of the SnapLAN hub and allows you to monitor and control the stack.



IT'S A SNAP: The SnapLAN's snapping mechanism makes hub setup simple. To install a new module, you simply line it up with the connectors and slide it over until it clicks.



FACT FILE

SnapLAN

List price. Ethernet management module (8 ports), \$1,205; Ethernet modules, \$680 to \$1,180; Token-Ring management module (4 ports), \$1,995; Token-Ring module (12 ports), \$1,995; Wellfleet Communications router modules, \$3,995 to \$6,495; Power module, \$295; Management software, \$3,500 to \$21,000. In Short: The SnapLAN stackable hub not only simplifies hub setup with a unique snap-together design, but it also provides all the connectivity and management features you'd expect in a good hub—stackable or chassis-based. Management of the SnapLAN's Wellfleet router modules, however, requires the Unix-based Wellfleet Site Manager software, which poses a problem for non-Wellfleet shops.

ADC Fibermux Corp., 21415 Plummer St., Chatsworth, CA 91311; 818-709-6000, 818-709-1556

Circle 960 on reader service card

LightWatch, we had to load NDIS drivers as well as the TCP/IP protocol stack. Our test-bed was running NetWare 3.11, and you can't use NDIS drivers with NetWare's IPX unless you're running Microsoft Windows NT, Microsoft Windows for Workgroups, or some third-party application that provides an NDIS interface for Novell's ODI drivers. Our system was running Windows 3.1, so we had to reboot to switch between managing the hub and using NetWare. You can always dedicate a PC as the hub-management station, but you'll want to use at least a 486 with 8MB of RAM to run HP OpenView.

Because a TCP/IP protocol stack is required on the management console, a single-user copy of NetManage's Newt TCP/IP software is included with the hub. Fibermux bundles LightWatch, Newt, and OpenView at an additional charge of \$3,500. This bundle, however, does not include any management applications for the router modules.

The Wellfleet router modules, which we did not test, are available with either Token-Ring or Ethernet LAN connections and one or two WAN ports for frame relay, RS-232, V.28, V.35, X.21, and X.25 connections. These modules can route most major network protocols, including AppleTalk, IPX, IP, NetBIOS, and DECnet, and they range in price from \$3,995 to \$6,495. That's not the final price, however, because you need WellFleet's Site Manager software to manage them, and Site Manager currently runs only on Unix machines. This could be a serious problem for users who do not already use Wellfleet routers on their networks; we would hardly expect anyone to buy a Unix management station to monitor a stackable hub.

Still, the main selling point for the SnapLAN hub is ease of installation. Simply put, anyone can set up the SnapLAN. The connectivity features are there and so is the manageability—but you will have to pay to use and manage those router modules.

IMAGINE
HAVING
SUPER
SPEED...

...THE ABILITY
TO REACH
AROUND
THE WORLD...

...AND MORE
UTILITIES
THAN ANY
CAPED
CRUSADER!

YOU'VE BECOME...

**CAPTAIN
ACCESS**



Are you tired of getting sand kicked in your face by remote LAN users? Turn into a real *super* hero — with powers and abilities far beyond those of mortal LAN managers. Become Captain Access.

a speeding bullet, more powerful than a locomotive, and (deep voice) *integrate seamlessly with Novell Netware*. United in a common cause, this dynamic duo will even empower users to read their faxes *remotely*.

THE AMAZING FAX SERVER

Banish interminable fax lines, jammed fax machines and undelivered faxes from your universe forever!

With the Shared Access FAX server™ network users can send and receive faxes directly from their PCs. Instantly. They don't have to be rocket scientists, either — they can fax from within any DOS or Windows application they already know.

They can even use their E-mail to send and receive faxes.

THE INCREDIBLE COM SERVER

It's a bird, it's a plane, it's...whatever you want it to be. The Shared Access COM server™ is an upgradable, *open-platform* communications server. You can turn the COM server into a mail router, make it a remote control station, or set it up for modem sharing — the possibilities are limited only by your imagination.

Both the FAX server and COM server are faster than

GET YOUR FREE CAPTAIN ACCESS UTILITY KIT!

Be a hero. Be Captain Access! Slip into a phone booth and call 1-800-USR-CORP, or mail the coupon below, today. We'll send you all the info you need to become a real superhero and give your Novell Netware LAN *unlimited* power.

I WANT TO
BE A
SUPERHERO

Send me my FREE top secret Captain Access Utility Kit, filled with all the tools I'll need to become...CAPTAIN ACCESS.

Name _____
Title _____
Company _____
Address _____
City _____
State _____ Zip _____
Phone _____

Captain Access, U.S. Robotics, 8100 N. McCormick Blvd., Skokie, IL 60076-2999



SHARED ACCESS™

U.S. Robotics
The Intelligent Choice in Data Communications



U.S. Robotics and the USRobotics logo are registered trademarks of U.S. Robotics, Inc. Shared Access, Shared Access FAX server and Shared Access COM server are trademarks of U.S. Robotics. All other brand or product names are trademarks or registered trademarks of their respective companies.

CIRCLE 920 ON READER SERVICE CARD

**When's the
best time to
upgrade your
network
and get a
\$4,700
workgroup
productivity pack,
Free?**



► NOTES UTILITIES

ViP: A Very Impressive Product from Lotus

BY TONY POMPILI

Finally, there's a powerful, graphical, and intuitive tool for developing Lotus Notes applications. Lotus Notes ViP for Windows, Version 1.0, is the first object-oriented programming tool built from the ground up to work specifically with Notes, and it can make life a lot easier for Notes developers.

Typically, you have to know your way around C to develop a Notes application. The \$995 ViP package does away with that requirement through a friendly, graphical interface that lets you fine-tune your application's look and feel at the same time you code the app itself. Furthermore, ViP incorporates Microsoft's Open Database Connectivity (ODBC) specification, so that apps developed with ViP can talk not only to Notes databases, but to those in Access, dBASE, DB2, DB2/D, Informix, Paradox, and SQL formats. It also provides a valuable report generator and graphing tool.

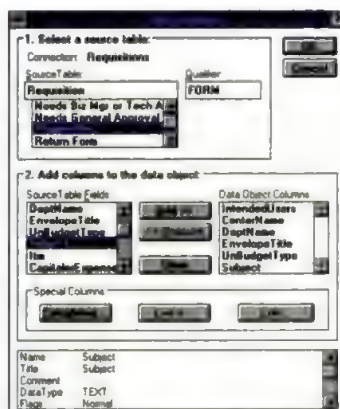
One thing is clear: ViP is squarely targeted at the Notes client base and is not cost-effective for non-Notes sites. At least one

copy of ViP Designer is required to create ViP apps. But these apps can be used with the runtime version of ViP, which should ship by the time you read this. It will be free to Notes users but will not be available to non-Notes users. Non-Notes sites will require a copy of the full ViP Designer package for each client that needs to run ViP apps.

The design of the product follows right along with the pricing. Most competitors in the Notes development arena, such as Power-

FAMILY TIES: ViP Designer lets you customize your apps' interfaces with familiar Notes objects.

Soft Corp.'s PowerBuilder Library, are actually add-on products for development tools that were not designed specifically for the Notes environment. ViP, however, was born and bred for Notes. For example, ViP works with the Notes API on the server, so it utilizes all of Notes' security features; a valid Notes ID is required both to develop and use ViP apps, although the Notes client software is not required to do so. Also because of the tight integration, we found it easy to find and incorporate Notes databases into our apps, and then add graphical tables of the databases to our apps' interfaces.



Probably the most striking element of ViP Designer is the interface. A toolbar lets you place common interface elements like buttons, text boxes, and database data objects into an app. We were writing simple code with ViP in no time by simply connecting objects with *links* and then defining from a list the action those links should take, such as launching a database query when an entry was typed into a text box.

Of course, while we're drawing text boxes and menus on the screen with ViP, we're actually writing code. ViP code is written in LotusScript 2.0, which is similar to BASIC and is also utilized by Lotus's Improve and Forms products. The commands, func-



PUSHING THE RIGHT BUTTON: ViP's toolbar allows you to place links, buttons, and other objects by simply clicking your mouse.

tions, and syntax are nearly identical to BASIC, though some are unique to ViP. These commands deal with the unique ViP data structures, such as *objects*, *methods*, and *links*, each of which is the LotusScript equivalent of a box or menu created in the graphical environment.

ViP also has a pair of tools Notes developers will be happy to see: a reporting tool and a charting utility. We found both easy to use, particularly the charting package, which let us link the results of a query to a chart in seconds to produce colorful pie and bar charts.

To access non-Notes databases, ViP uses ODBC, a high-level protocol, developed by Microsoft, that allows an application to access a variety of database types. We pulled data from and placed data into dBASE, Lotus 1-2-3, and Paradox files from our ViP app and found that the ODBC implementation worked without a hitch.

Of course, ViP's features come with a price: You still need to know programming. Creating a simple graphing application took us only a few minutes, but developing an application to choose and export specific records from a Notes database to a dBASE file? That required us to hit the books and do some serious coding.

Unlike Microsoft Visual Basic, which supports calls to .VBX files to enhance an app's code, ViP supports calls to less powerful .DLL files.

Also, ViP's performance could use some improvement. It took nearly 3 and a half minutes to copy 467 four-field records from a Notes database to a dBASE file. That's a long time. It even takes a while to load apps developed with ViP.

Still, ViP is a major leap forward for Notes development tools. The graphical front end, ODBC support, and reporting and charting features, have all been missing from Notes developers' lives until now. ViP, and its graphical programming environment and powerful links to a myriad of databases, should get more Notes apps off of the drawing board and into everyday use where they belong.

► **Lotus Notes ViP for Windows, Version 1.0.** List price: \$995. Lotus Development Corp., 55 Cambridge Pkwy., Cambridge, MA 02142; 800-343-5414, 617-577-8500.

Circle 966 on Reader service card

Now!

If you're planning to upgrade your network sometime in the future—the future has just arrived.

Novell has pulled together a tremendous offer to make it cost-effective for you to upgrade to either NetWare 3.12™ or NetWare 4.02™ right now. So whether you're moving from peer-to-peer to client/server or want to expand the performance and capabilities of your current system, Novell has the most proven, advanced network operating systems available. All at upgrade prices that have just been reduced across the board.

What's more, when you upgrade any network to NetWare 3.12 or 4.02 for 10 or more users by October 31, you'll get Novell's GroupWise™ productivity package worth \$4,700—free. The pack includes GroupWise (formerly WordPerfect Office), the most comprehensive E-mail, scheduling and calendaring, task management program, plus a Message Server NLM and MHS NLM Gateway. So call 1-800-BUY NOVL or your local Novell reseller to find out more. Because there's never been a better time to upgrade your network and work-group productivity.

 **NOVELL**

The Past, Present, and Future of Network Computing



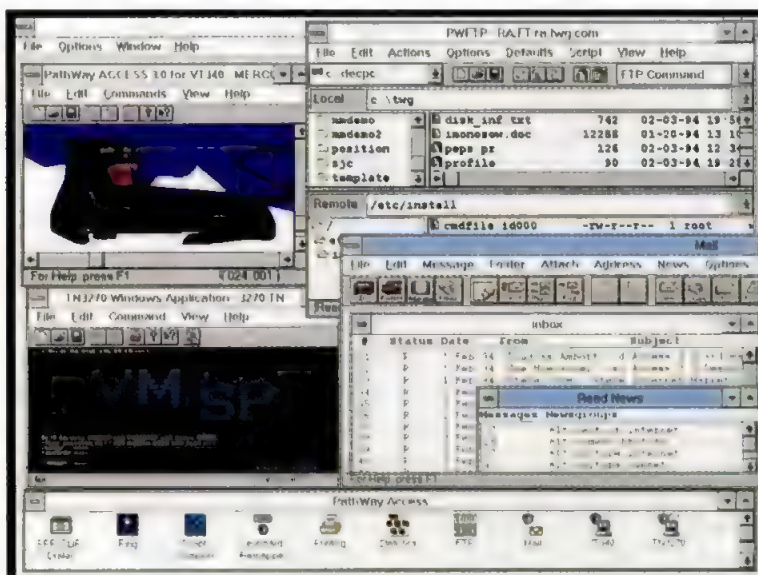
CIRCLE 950 ON READER SERVICE CARD

TCP/IP for Windows Never Looked So Good.

New!
RELEASE 3.0

PathWay Access

- ❑ Windows Sockets applications
- ❑ Terminal emulations
 - TN3270 (with IND\$file)
 - VT100-320
 - VT240/340, 3179G graphics
 - Tektronix 4105/4010
- ❑ FTP Client and Server
- ❑ Internet Mail/News Reader
- ❑ Printing Services (LPR/LPD/IPR)
- ❑ Script Language and Compiler
- ❑ Graphical Keyboard Remapper
- ❑ SNMP Agent and Diagnostics
- ❑ PathWay Client NFS Option
- ❑ NDIS/ODI/ASI/PDS/X.25
- ❑ NetBIOS over TCP/IP
- ❑ Remote Access (PPP/SLIP/CSLIP)
- ❑ Extensive Third-Party Support



If you need to access TCP/IP networks from Windows, choose the product that gives you more than just a pretty user interface.

PathWay Access 3.0 sets a new standard in networking by providing the most rock-solid and easy-to-use, complete TCP/IP solution available. PathWay Access 3.0 includes true Windows applications while supporting all the DOS applications you already have. So when your users need access to the full power of your TCP/IP network -- with the native user interface they prefer -- PathWay Access 3.0 is the best choice. Nothing else even comes close. Call today for details on our competitive upgrade offer available for a limited time only. And we'll also send you our free PathWay Access demo disk that proves why TCP/IP has never looked so good.

WOLLONGONG

STRAIGHT TALK. SOLID SOLUTIONS.

1 • 8 0 0 • 8 7 2 • 8 6 4 9



See Us At Interop
Booth #1840

News of announced network products and upgrades

By Vicki B. Jacobson

IMPROVED

Xylogics Services Remote NetWare Users

Xylogics now provides IPX users with integrated dial-in and dial-out services and management and security features from within a communication server. Release 9.0 of its remote-access package, Annex Software, targets the same market as Shiva's LanRover product—with a few differences. Annex supports up to 64 users (LanRover, only 8), includes a TCP/IP stack for the PC (LanRover offers IP as an option), and allows the software to be managed remotely.

Annex supports a variety of remote-access users, including PCs, Macintoshes, Unix workstations, X-terminals, and ANSI/ASCII terminals; it also supports a variety of hosts, including IBM and DEC VAX. The software allows dial-in access to NetWare networks using Xylogics' own FastLink PC client software. Release 9.0 can automatically detect the protocol being used for dial-in (whether it be IPX, IP, or AppleTalk) and switch to that mode, allowing all users to dial in to the same modem.

► **Annex Software, Release 9.0.** List price: \$495. Xylogics Inc., 53 Third Ave., Burlington, MA 01803; 800-225-3317.

Circle 952 on reader service card

IMPROVED

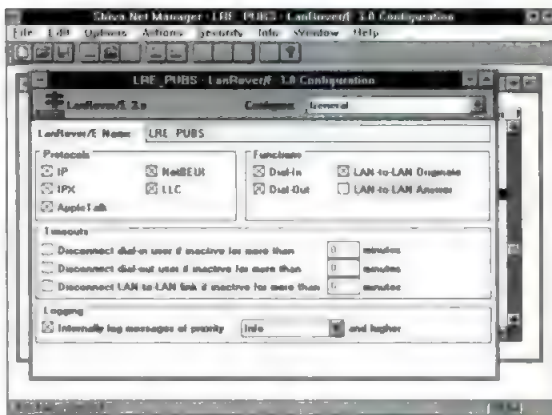
Shiva Expands Its All-in-One Access

Shiva Corp., like Xylogics, is out to conquer the remote-access market with the latest version of its multiprotocol, multiplatform remote-access server. Version 3.0 of LanRover supports simultaneous AppleTalk, IP, IPX, LLC (Logical Link Control, a protocol for transmission at the data-link level), and NetBEUI protocols. Xylogics offers AppleTalk, IP, and IPX.

PC, Macintosh, and Unix users can share one line to dial in to the network. The software supports a variety of environments, including Microsoft LAN Manager, Windows for Workgroups, and Windows NT, as well as Novell's NetWare. Version 3.0 also includes a variety of management features for monitoring scheduled connections and dial-back—all from a Macintosh or a PC. LanRover offers additional protection with the integration of Security Dynamics' ACE/Server, eliminating the devices that sat between the remote-access server and its modems.

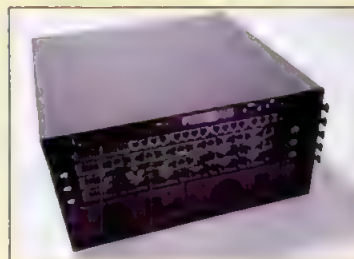
► **LanRover, Version 3.0.** List price: \$250 to \$849. Shiva Corp., Northwest Park, 63 Third Ave., Burlington, MA 01803; 617-270-8300; fax, 617-270-8599.

Circle 953 on reader service card



STACKED: LanRover provides simultaneous support for a variety of protocols.

HOT PROSPECT



Alantec's Hub Gains Ports and Power

Alantec Corp.'s latest intelligent switching hub, the PowerHub 7000, accommodates bandwidth of up to 3.2 gigabits per second (Gbps)—plenty for multimedia and videoconferencing and far more than the 10 Mbps of many standard hubs.

The PowerHub 7000 integrates the software and management features found in previous Alantec hubs (the PowerHub 3000 and 5000) with its expanded backbone. It also includes support for Virtual LANs (the creation of logical workgroups) and port monitoring. Multiprotocol routing can be done through the use of AppleTalk, DECnet, IPX, and TCP/IP.

The hub is offered as a 5-, 10-, 15-, or 20-slot chassis. It supports up to 240 Ethernet segments, up to 16 FDDI ports, 2 to 20 RISC CPUs, and throughput from 60,000 to 80,000 packets per second. As for power supplies, the PowerHub 7000 comes with two Power Chassis, each capable of hot-swapping.

► **PowerHub 7000.** List Price: \$19,410 to \$86,200. Alantec Corp., 70 Plummeria Dr., San Jose, CA 95134-2134; 800-252-6832.

Circle 951 on reader service card



With all this talk about network printing, QMS CrownNet makes sense of it all!

Continuing its role as industry leader in network printing, QMS® proudly announces CrownNet™—simultaneously supporting and accommodating all major network interfaces and major protocols on a single network connection. CrownNet technology provides true enterprise network printing. And that's not just idle chatter! You can lower per-user, equipment, maintenance and training costs by better utilizing workgroup processing resources.



Network administrators can now remotely configure QMS CrownNet™ print systems from anywhere on the network with CrownNet's remote console capability. CrownNet makes high quality print resource sharing a reality, allowing you the time to concentrate on building truly competitive enterprise networks. Follow the leader to the first real "enterprise level," CrownNet-enhanced network printers. Call 800 972-6708 Dept. 4039 for more information.



For service on QMS and other products, call 800 762-8894 (U.S.) • Q-Fax 800 633-7213
E-mail: info@qms.com • Canada 800 263-5508

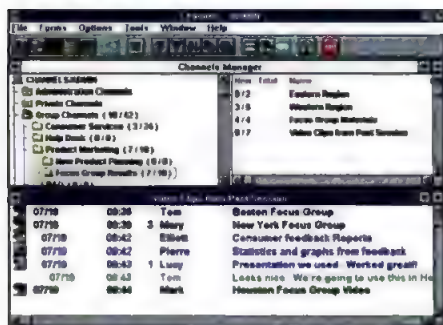
Nobody Delivers Seamless Network Printing Like We Do.

QMS, the QMS logo, CrownNet and Crown are trademarks or registered trademarks of QMS, Inc. One Magnum Pass, Mobile, AL 36618. 205 633-4300

CIRCLE 899 ON READER SERVICE CARD

IMPROVED

TEAM Adds Multimedia to Discussion Groups



CHANGING CHANNELS: TEAM incorporates OLE into its discussion software.

► **Channels, Version 1.1.** List price: \$549 (10-user package). TEAM Software Inc., 5858 Westheimer, #405, Houston, TX 77057-0759; 800-785-1112.

Circle 954 on reader service card

NEW

Wireless Goes Cruisin'

The **Mobile Systems Group** of **Zenith Data Systems** announced its entry into the wireless market with the CruiseLAN line. The product set (developed in conjunction with Proxim) includes a PCMCIA card, an ISA LAN adapter, and a wireless bridge. Though the PCMCIA card is offered only by ZDS, the rest of the CruiseLAN line uses Proxim's technology. All of the products can achieve throughput rates of up to 1.6 Mbps, feature error detection and correction, and use spread-spectrum technology for wireless communication.

CruiseLAN/PCMCIA is a Type II card that has a range of 500 feet (in a typical office situation) to 1,000 feet (in an open space). The card comes with ODI drivers for Artisoft's LANtastic, Microsoft LAN Manager and Windows for Workgroups, and Novell's NetWare networks.

CruiseLAN/ISA is a 16-bit adapter for your PC or server and CruiseLAN/Access Point is the bridge that extends the throughput and range of the cards. Each adds an additional 1.6 Mbps to the network.

► **CruiseLAN/PCMCIA.** List price: \$695. **CruiseLAN/ISA.** List price: \$595.

CruiseLAN/Access Point. List price: \$1,895. Zenith Data Systems, 2150 E. Lake Cook Rd., Buffalo Grove, IL 60089; 800-533-0331.

Circle 955 on reader service card

NEW

FastLan Brings Users a . . . Faster LAN

FastLan Solutions provides 100-Mbps throughput (Fast Ethernet) for communicating within a workgroup or for connection to a server. The FastGroup 4000 and 8000 (four- and eight-port units) allow PCs or Sun workstations to be grouped together and operate as a standalone network while using the 100-Mbps CSMA/CD Ethernet standard. Workstations can be connected to the units at distances of up to 10 meters. For connection to the enterprise, FastLan introduced the FastBridge 1200, a two-port, full-duplex Ethernet bridge offering users speeds of 10 or 100 Mbps.

► **FastGroup 4000.** List price: \$895. **FastGroup 8000.** List price: \$1,295. **FastBridge 1200.** List price: \$1,895-\$2,095. FastLan Solutions Inc., 27297 Byrne Park Ln., Los Altos Hills, CA 94022; 415-941-6883; fax, 415-941-5424.

Circle 956 on reader service card

Collaborating via computer is becoming more productive with the addition of multimedia to **TEAM Software's** real-time, interactive communications software. Channels, Version 1.1, uses OLE as well as a distributed optic library to incorporate graphics, voice, and video into discussion forums. The workgroup software is based on a Remote Procedure Call distributed client/server architecture for operation over LAN and WAN networks. This latest version also includes additional IPX support as well as an improved user interface, Channels Manager, that anticipates Chicago's release.

BRIEFS

HUBS

Farallon Computing introduced two new unmanaged hubs designed for small 10BaseT networks (20 nodes or less). The Ether10-T Starlet/4 (\$219) and the Ether10-T Starlet/16 (\$699) feature 4 and 16 ports, respectively, and work in Microsoft Windows, DOS, and Macintosh environments. These hubs complement the Ether10-T Starlet/8 (reduced to \$299). All the hubs can be connected together or to an Ethernet backbone for expanding to a larger network. 510-814-5100; fax, 510-814-5020.

Global Data Supply also announced two hubs for small networks: the Magnum Personal Hub family.

These hubs can connect workgroups consisting of Ethernet devices such as PCs, Macs, workstations, and printers. The five-port H50 Magnum Personal Hub (\$295) and the nine-port H90 Magnum Personal Hub (\$395) are each the size of a paperback book and feature an external power supply. The H50 has four front-mounted RJ-45 ports and one rear-mounted RJ-45 up-link port for connection to another device. The H90 offers eight front-mounted RJ-45 ports for 10BaseT connections and one rear-mounted port of the same type that is used on the H50. 408-993-1881.

MODEMS

Apex Data doubles the speed of its Slim Line Type II fax modems (\$499), boosting throughput to 28.8 Kbps. The Slim Line modems will also be compatible with the V.34 standard once the chip sets become available. The modems feature Advanced Error Correction via V.42 protocols as well as data-compression capabilities. 510-416-5656; fax, 510-416-0909.

NEW

High-Speed Networking Comes In like Thunder

A new chip set from **Compaq Computer Corp.** and **Texas Instruments (TI)** will give the new Fast Ethernet products from companies such as FastLan Solutions a real boost. The two companies have announced ThunderLAN—an architecture for accommodating both current 10-Mbps technologies and future 100-Mbps technologies, including the 10BaseT/100BaseT or the 10BaseT/100 VG AnyLAN protocol.

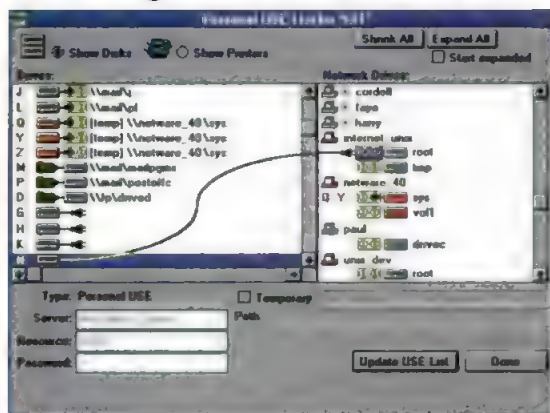
The chip solution will combine TI's silicon expertise and PacketBlaster technology with Compaq's knowledge of drivers and the PCI bus design. ThunderLAN products will integrate 100-Mbps Ethernet protocols, support for PCI, a multiprotocol driver suite, and the Adaptive Performance Optimization (APO) feature on the drivers, which increases bandwidth performance by minimizing latency.

► **ThunderLAN.** Compaq Computer Corp., Customer Support Center, P.O. Box 692, Houston, TX 77269-2000; 800-345-1518. Texas Instruments Inc., Semiconductor Group, SC-94084, P.O. Box 172228, Denver, CO 80217; 800-477-8924.

Circle 957 on reader service card

IMPROVED

PT Strengthens Server Software



MAKING A CONNECTION: POWERfusion displays NetWare servers and their disk substructures.

Version 2.2 of **Performance Technology's** Unix-based server software, **POWERfusion**, offers improved ease-of-use, additional Unix platform support, and NetWare connectivity for its Microsoft Windows and DOS clients. The software includes file- and print-sharing server software and file transfer and terminal-emulation capabilities, as well as two-way DOS/Windows-to-Unix printer sharing. Version 2.2 also recognizes NetWare clients, allowing them to connect to Unix via the bundled peer-client software—

POWERlan, Version 3.1. **POWERfusion** spreads its Unix wings with the addition of support for AIX and SCO.

► **POWERfusion, Version 2.2.** List price: \$200 to \$12,000. (user packs) Performance Technology, 800 Lincoln Center, 7800 IH-10 West, San Antonio, TX 78230; 800-327-8526.

Circle 958 on reader service card

NEW

CrossCom Introduces Three-Tier Management Solution

CrossCom Corp.'s new network-management products encompass the entire network, even remote users. The Virtual On-site Technology (VOT) product set is broken down into three levels. VOT Level 1 includes CrossCom's Internetwork Management Software (IMS), which is based on HP OpenView; IMS supports SNMP and can be run from a single workstation. Level 2 adds troubleshooting capabilities. Level 3 expands on the first two levels with ExpertHelper, a client-server help desk and tracking application.

► **Virtual On-site Technology.** List price: \$5,995 to \$11,995. CrossCom Corp., 450 Donald Lynch Blvd., Marlborough, MA 01752; 508-481-4060.

Circle 959 on reader service card

BRIEFS

ADAPTERS

Thomas-Conrad Corp. brings the Plug and Play ISA standard to Token-Ring in its TC4145 series. The TC4145-C (\$350) and the TC4145-S (pricing to be announced) feature ease of installation and increased speed through bus mastering. Using Thomas-Conrad's PacketBlaster technology, the TC4145-S can extend its throughput to 26,000 packets per second. Compliance with the FCC Class B certification ensures lower electromagnetic emissions. 800-332-8683, 512-836-1935.

Cardwell International Corp. introduced its new line of PCMCIA cards for mobile and desktop PCs. Included is the Ethernet LAN Card (\$229), which can be configured for 10BaseT or 10Base2 environments. The card supports a variety of NOSs, including Banyan's VINES, Microsoft LAN Manager and Windows for Workgroups, and Novell's NetWare and NetWare Lite. 916-985-1880.

PRINT SERVERS

Castelle announced the latest addition to its line of NetWare-compatible print servers—the LANpress 2P Extra. The new print server is available for Ethernet (\$499) and Token-Ring (\$599) networks. LANpress includes simultaneous support for Novell and Unix environments. It also features SNMP support. 408-496-0474.

Digital Products and **Phoenix Technologies** combined efforts to bring a standard for an open architecture to the printer expansion market. The Printer Expansion Port (PEP) specification details a standard network interface for OEMs to use in developing easy-to-install, off-the-shelf network printing and faxing solutions. 617-647-1234.



**Microcom delivers
highest end-to-end
performance in remote
LAN access testing**

In a test of Windows file transfer speeds with eight simultaneous users, LANexpress performed up to 10 times faster than all other products tested.

Cumulative Throughput (bps)

800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000

Number of Users

All tests conducted by
The Tolly Group, formerly
InterLAB, the industry's premier
source for authoritative, independent
testing.



MICROCOM'S LANexpress BREAKS THE BARRIERS TO HIGH-SPEED REMOTE LAN ACCESS PERFORMANCE.

The numbers tell the story. In a strenuous battery of over 100 tests by The Tolly Group, Microcom's LANexpress™ delivered up to 10 times the performance of the other remote LAN access products tested.

Under the load of eight simultaneous remote PC users, LANexpress sustained file transfer speeds—in Windows—of over 100 Kbps per port, for an aggregate throughput of over 800 Kbps. (The closest competitor's

"Microcom's LANexpress exhibited significant performance benefits over the other products tested... (and was) the only device that did not exhibit significant operational problems."

—The Tolly Group

"...faster than any other dial-up remote access device PC Week Labs has tested."

—PC Week



Free Performance Report

To help you evaluate remote LAN access solutions, we'll send you a complimentary copy of The Tolly Group Report with facts and figures on all the products tested. Just call the toll-free number.

data back to your office LAN at the same time. A 1 MB file that took you two minutes to send via LANexpress would take from 12 minutes to *over half an hour* using the other products tested.

The Tolly Group also found that under the stress of these real-world operating loads, LANexpress was the only one that remained stable throughout testing.

To network managers faced with growing demands for remote access to corporate LANs, the report's message is clear: LANexpress is the only remote access solution designed for high end-to-end multi-user performance. It figures.

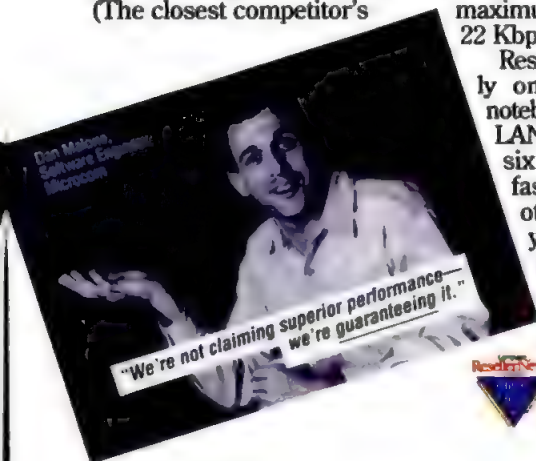
For a free copy of The Tolly Group Report and the name of your Microcom reseller, phone
1-800-822-8224

microcom

The brightest ideas in remote access.

Microcom, Inc., USA (617) 551-1000 • Microcom U.K. Limited, (44) 483-740763
Microcom E.M.A., France (33) 1 46 62 68 68 • Microcom Singapore, (65) 295-2061
Microcom Australia, (61) 2 410-9953

Microcom is a registered trademark and LANexpress is a trademark of Microcom Systems, Inc.
All other trademarks are the property of their respective trademark holders.
*Developer Tested Only. Microsoft makes no warranties with respect to this product.



Go mobile. **Take your network** **on the road with** **NetWare Connect.**



Being mobile once meant being disconnected from all your computing resources. With

NetWare Connect™, mobile means complete access to your network.

NetWare Connect allows you to take your whole network on the road. From any laptop, you can access E-mail, groupware applications, file, print and other network services. All this using standard off-the-shelf communications products.

As a user, you'll love the seamless connectivity. As a network manager, you'll appreciate how easy it is to consolidate inbound and outbound communications on a single platform. Your network will

be more manageable and secure with NetWare Connect.

With all these features, it's no wonder that NetWare Connect is supported by the industry's leading software and hardware vendors. Act now, and you'll get a 30 day free trial and up to

\$750 in rebates on Cheyenne's FAXserve™ for NetWare® when you purchase NetWare Connect before October 31, 1994.

Before you take to the road again, call 1-800-BUY NOVL or your local reseller to learn more about NetWare Connect. And discover a seamless way to increase productivity on the road.



 **NOVELL**

The Past, Present, and Future of Network Computing.

CIRCLE 890 ON READER SERVICE CARD

When Companies Collide

Last month's announced merger between Synoptics and Wellfleet sent ripples through the internetworking community. The combined forces of Synoptics (the leading hub company) and Wellfleet (the fast-growing router vendor) will create the second billion-dollar internetworking vendor. (3Com was the first.)

Is it a good idea? You betcha—at least from the technology angle. These two companies are almost perfectly synergistic. Synoptics brings high-powered hubbing and indirect sales; Wellfleet brings high-powered routing and direct sales. Combined, the two can go after the low-end hub and router market and still tackle the high-end internetworking market.

Here's how it'll play out. Synoptics's management strategy, like that of so many hub vendors, is to move users to networks based on virtual LANs (VLANs). VLANs improve security by decoupling the logical network from the physical network.

In the past, in order for users to be part of the same workgroup—accounting, for example—they had to be located on the same subnetwork. Locating users on subnetworks where there may be members of other workgroups meant risking disclosure of sensitive information.

VLANs get around the problem by grouping users logically, not physically. Only users on specific ports can see sensitive traffic. Thus, workgroups can span multiple networks without maintaining complex filters at the router.

For Synoptics, a high-speed router in the VLAN concept is critical. Whereas the router used to connect physical networks, it now connects logical networks.

The router looks at the frame coming from one segment, checks its address, and looks up the virtual workgroup it's associated with. Once the workgroup is identified, the packet is sent out to the hub, where it is forwarded to the receiving client.

To accomplish this job, however, there must be tight logical integration of the router and the hub. Later there will need to be tight physical integration of the router and the hub, forming yet another class of product. The merger with Wellfleet gives Synoptics the critical router technology it needs to maintain an edge in the hub market.

It gives Wellfleet the channel to tackle the booming low-end router market. And for users, it may offer better integrated internetworking products. Oh what a deal.



David Greenfield:
The synergism of high-powered hubbing and routing makes this deal so attractive.

Oh my, David, did that press release tickle when you swallowed it whole? Remember, companies have two products: the stuff that ships from the loading dock and the shares that trade on the stock market. This merger was a move for the financial analysts—pure and simple. Now I don't quarrel with the benefits of virtualized subnetworks. As we flatten organizations, we need flexible and instant means of creating virtual workgroups; you've got that right. But I sure don't think for a minute that a merger of Synoptics and Wellfleet is really about technology.

In today's world of products with 9-month life cycles, new technology is something you license or buy. When you have to respond to markets and developments that change so fast, forget about big companies, David. Virtual relationships can perform much faster high-tech footwork than conglomerates can.



Frank Derfler:
This merger is an attempt to find a way to continue growth. The signs I see say that it won't work.

I suspect that the managers at Wellfleet are afraid they can't continue their meteoric revenue growth and that the fickle stock market will hang them out to dry. The major buyers of router technology have made their infrastructure decisions. Companies such as 3Com that understand marketing will eat away at the soft underbelly presented by Wellfleet: small new organizations with budding router needs and smaller budgets. On the horizon, ATM threatens to make the entire router concept obsolete.

So what better way to look as if you're growing and to keep the analysts entranced than by buying a company with a lot of revenue? Unfortunately, Synoptics is struggling under a high-end head-in-the-sand strategy almost as bad as Wellfleet's, and a downhill revenue stream is the result.

And what about the jilted Cisco? Just last year, Synoptics was happily helping people put Cisco routers in their hubs. Interestingly, Cisco seems to understand that it can't continue to grow simply by selling into the installed base. Cisco's announcement of routers on PC adapter cards is a sign that the company's managers see the direction of growth. It remains to be seen if they understand the dynamics of the channels and support needed to sell to smaller companies.

The bottom line, David, is analyst-phobia. This merger is an attempt to find a way to continue growth. The signs I see say that it won't work.

**HARDWARE**

Communications Devices.....	NE32
Diagnostic/Management/Test	NE33
Hubs/Routers/Bridges	
Network Interface Cards	
Mass Storage/Network Backup	
Power Supplies/UPS	
Printers/Print Devices	NE33
Systems/Servers	NE33

SOFTWARE

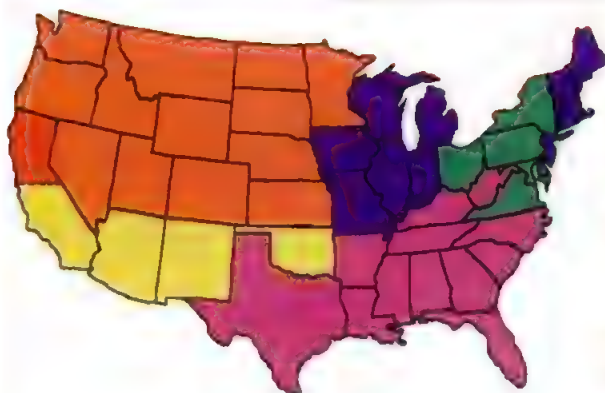
Diagnostic/Management/Test
Networked Applications

SERVICES

Consultants/Systems Development.....
Network Data Backup/Recovery.....
Vars/Systems Integrators

MISCELLANEOUS

Cables/Wiring/Connectors.....



SALES MANAGER Monte Wasch (212) 503-5182

ACCOUNT MANAGER Leslie Eddy (212) 503-5171

SR. ACCOUNT REP. Bill Herbst (212) 503-5193

ACCOUNT REP. Elisabeth Drumm (212) 503-5118

ACCOUNT REP. Carolyn Goldfarb (212) 503-5076

territory also includes Alaska & Hawaii

ACCOUNT REP. Maggie Hewit (212) 503-5156

ACCOUNT REP. (212) 503-5115

territory also includes Canada & foreign



COMPLETE SYSTEM CONTROL



THE APEX DESKTOP CONCENTRATOR

Compact, highly functional unit allows complete control of each system with single keyboard, mouse and monitor. Maintains connection with each system, assuring complete, reliable system restart after power failures or commanded reboot. Four- and eight-channel versions available.

Call For More Information:
206-861-5858



1500 150th Avenue NE, Redmond, WA 98052 FAX: 206-861-5757



FROM ONE KEYBOARD

Video, Keyboard, Mouse Concentration

Automatic System Restart

Keyboard System Selection

Connect Up to 64 Systems

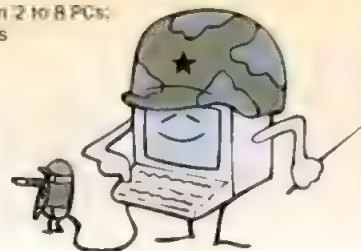
Internal Power Supply

Internal Power Supply

AutoBoot Commander™

Control up to 96 file servers with just 1 keyboard, monitor and mouse!

- Supports all 100% IBM compatible computers
- New KeyScan™ feature for keyboard-controlled scanning
- Jumperless support for analog (VGA) and TTL video
- Add a second control center up to 150 feet away
- AutoBoot™ feature boots computers without operator intervention
- Each unit controls from 2 to 8 PCs; cascade up to 12 units



For Macintosh support,
ask about our new
Mediator™ for Macintosh!

Cybex Corporation
4912 Research Drive • Huntsville, AL 35805 USA
(205) 430-4000 • FAX (205) 430-4030



IBM is a trademark of IBM Corporation. Macintosh is a trademark of Apple Computer, Inc.
Dealer Program Available Made in USA

mcw AT-Lan-Tec LAN Connectivity... We do it ALL-RIGHT with Affordable Quality!

E-Link III 3C509 TP 5pk/20pk	\$85/90ea
E-Link III 3C509 BNC 5pk/20pk	\$85/90ea
E-Link III 3C509 Combo 5pk/20pk	\$85/93ea

Category 5 UTP Cable
Pre-Moulded Cable Ends Available in a rainbow of colors

Category-5 UTP 75ft	\$ 8
Category-5 UTP 100ft	\$ 12
Category-5 UTP 140ft	\$ 15
Category-5 UTP 250ft	\$ 18
Category-5 UTP 500ft	\$ 27
Category-5 UTP 1000ft	\$ 30

Pre-Moulded Coaxial Cable

Coaxial RG58/RG62 100ft	\$ 7
Coaxial RG58/RG62 250ft	\$ 10
Coaxial RG58/RG62 500ft	\$ 13
Coaxial RG58/RG62 1000ft	\$ 20

TESTER for CABLE RG58 & RG6 \$89
NOVELL NE2100 BNC/ATN \$ 30

3.12 5 user	\$ 595
3.12 10 user	\$1399
3.12 25 user	\$1875
3.12 50 user	\$2499
3.12 100 user	\$3390

AT-Lan-Tec Hardware

NE1000 8-bit BNC or TP	\$ 59
NE2000 2 in 1 Combo	\$ 46
NE2000 3 in 1 Combo	\$ 48
NE2100 3 in 1 Combo	\$ 64
PCI 2 in 1 Ethernet	\$160
Hub 16-Port RJ45	\$399
Hub 32-Port RJ45	\$699
SNM Hub 16-Port RJ45	\$799
Pocket Adapter 2 in 1	\$129

301-948-7070 BBS 301.990.6998
Settings 14.4, 8, N, 1

CIRCLE 822 ON READER SERVICE CARD

**PC Magazine/
Network Edition is read
by 300,000 buyers,
twice a month.
No other publication
comes close.**

Shouldn't you be advertising your network product in the publication that reaches the most network product buyers?

Call 800-825-4237 today!

CONTROL

ALL YOUR PC SERVERS

FROM ONE KEYBOARD, MONITOR AND MOUSE

with *MasterConsole™*

**COMPARE QUALITY
AND PRICE PERFORMANCE**

- Save Space, Cut Costs & Centralize Control With 100% Reliability
- "Plug and Play" Any Mix of ATs & PS/2s, Supports PS/2 & Serial Mouse & All Video
- Desktop or 19" Rack Mount Models for 2, 4, 8, 16 PCs, Expand to 64
- Keyboard & Mouse Emulators for Error Free PC Operation and Autoboot
- AUTOSCAN™ to Monitor All PCs
- Remote Access up to 150 Feet
- Thousands in Use Worldwide GSA Schedule for U.S. Federal Govt.

NEW P Models shipping

"No other solution stacks up."

**CALL TODAY!
(908) 874-4072 x44**

RARITAN COMPUTER, INC. 10-1 Ilene Court, Belle Mead, NJ 08502 FAX (908) 874-5274

30-DAY MONEY BACK GUARANTEE FULL 1-YEAR WARRANTY

See us at PC Expo Chicago Booth #90.3

Germany - Immac	Tel: 0211-8558-2	Fax: 0211-8558-133
Japan - Prosode Corporation	Tel: 81-3-3254-6131	Fax: 81-3-3254-6134
Taiwan - Rantam Computer Taiwan, Inc.	Tel: 886-2218-1117	Fax: 886-2218-1221
The Netherlands - Artelcom B.V.	Tel: 31-10442-3313	Fax: 31-10442-3443
United Kingdom - Kemtron LTD	Tel: 44-244-536123	Fax: 44-244-531043

INTERNATIONAL RESELLER INQUIRIES WELCOME - CONTACT RCI (908) 874-4072

CIRCLE 824 ON READER SERVICE CARD

**100+ Users,
64 Configurations,
22 Operating
Environments,
4 Protocols**



Speed	
LZR 1580: 15 ppm	LZR 2080: 20 ppm
Resolution (dpi)	
300x300	400x400, 600x600, 800x800
Paper Handling	
1, 2 or 3 cassettes, 250 sheets each Paper sizes up to 11" x 17"	
Interfacing	
Ethernet with VPT, LocalTalk, RS-232-C	
Protocols	
Novell IPX, Apple EtherTalk, UNIX TCP/IP, DEC LAT	
Operating Environments	
Novell NetWare, RSTS/E, RSX-11M-Plus, VMS, DECnet Phase IV, Apple Sys. Software, Apple AUX UNIX, AT&T Sys V w/Wollongong, Bull B O S UNIX, Data General dgux, HP-UX, IBM AIX, ICL System V, Interactive UNIX System V/386, Motorola System V, NCR Sys V UNIX, SCO UNIX, SunOS, Tadpole AT&T Sys V, Tandem Release A21 NonStop-UX, ULTRIX-32, Unsys System V	
Warranty	
One year, on-site	

Call Toll Free
800 x 800 dpi
(800/980-0374)

ONE PRINTER!

That is...if the printer is a Dataproducts LZR 1580 or LZR 2080. These powerful, versatile laser printers can serve the needs of your network, even if it's complex and multi-platform. With Virtual Printer Technology (VPT™), each LZR 1580 or LZR 2080 can act like 64 different virtual printers, each with its own configuration, including selection of emulation (PostScript Level 2 or PCL), paper tray, page orientation and job priority. And VPT doesn't require you to replace any of your current operating system software.

A simple-to-install option turns your LZR 1580 or LZR 2080 into a PostScript fax or modem with easy, inexpensive access for all network users. From 800 dpi imaging to 11" x 17" printing, PostScript or PCL, an LZR 1580 or LZR 2080 is the one printer that can produce what your network demands.

By the way, if your print requirements are 200,000 or even a million pages per month, a Typhoon 30 or 60 has the duty cycle and paper capacity you need.

Dataproducts
Taking your network printing by storm

©1994 Dataproducts Corporation. Dataproducts and Dataproducts with its associated logo are registered trademarks and VPT is a trademark of Dataproducts Corporation. All rights reserved. PostScript is a registered trademark of Adobe Systems Inc. All other trademarks and registered trademarks are the property of their respective owners.

CIRCLE 825 ON READER SERVICE CARD

MOVING?

Please write to: PC Magazine, P.O. Box 54093, Boulder, CO 80322. Include your mailing label from a recent issue of PC Magazine for faster service. Please allow up to 60 days for change of address to take place.

Network Edition Advertisers Index

Reader Service No.	Advertiser	Page	Reader Service No.	Advertiser	Page
910	3M Data Storage Products	101	*	Oracle Corp	NE4
934	Adaptec.....	NE17	867	Performance Technology	NE14
868	Cheyenne Software.....	NE7	929	Proteon Inc	NE13
894	Cheyenne Software.....	NE12	884	QMS	NE9
872	Combinet	NE15	899	QMS	NE26
882	Intel Corporation.....	NE2-NE3	936	Smith Micro Software, Inc.....	NE19
855	Micro Solutions Computer Products....	245	892	Triton Technologies Inc	NE10
862	Microcom	55	866	US Robotics Inc	23
893	Microcom	NE29	920	US Robotics Inc	NE21
877	NetManage, Inc.....	NE11	864	Wollongong Group	NE24
858	NOTIS Systems, Inc.....	384			
950	Novell, Inc	NE22-NE23			
890	Novell, Inc.....	NE30			

* No Reader Service #. Please Call Advertiser

FOR QUICKER RESPONSE
FAX TO
(609) 825-0692

FREE NETWORK PRODUCT INFORMATION

BUSINESS REPLY MAIL

FIRST CLASS MAIL PERMIT NO. 433 RIVERTON, NJ

POSTAGE WILL BE PAID BY ADDRESSEE



P.O. BOX 1687
RIVERTON, NJ 08077-8787

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES



Welcome...to the Network Section!

Circle the numbers below corresponding to products featured in the Network Section only. Use reader service card in the back of book to obtain information on other products. Fill in your name and address and answer the questions below. Manufacturers will mail FREE product literature to you.

Valid after January 31, 1995



FREE NETWORK PRODUCT INFORMATION REPLY CARD

820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849
850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879
880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909
910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939
940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969
970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999

1. Do you work in a DP/MIS dept.?
01 ☐ Yes 02 ☐ No
2. Please indicate your company or organization's primary business activity: (Check one)
01 ☐ Manufacturer Computer Equip., Computers, Software
02 ☐ Manufacturer-Aerospace
03 ☐ Manufacturer-Other
04 ☐ Systems House
05 ☐ Computer Consultant
06 ☐ Computer Retailer/VAR/VAD Distributor
07 ☐ Communications
08 ☐ Finance/Banking/Insurance/Real Estate/Accounting
09 ☐ Education
10 ☐ Government
11 ☐ Research and Development
12 ☐ Data Processing/Computer Service
13 ☐ Health/Medical/Legal Service
14 ☐ Engineering/Architecture
- 16 ☐ Agr./Const./Mining/Oil Transp./Utilities
17 ☐ Non-Computer Retailer/Dist.
18 ☐ Other Business or Service
3. Please indicate your primary business function: (Check one)
01 ☐ DP/MIS
02 ☐ Systems, Programming
03 ☐ Communications
04 ☐ Engineering
05 ☐ Res./Dev./Scientific
06 ☐ Accounting/Finance
07 ☐ Computer Consulting
08 ☐ Purchasing
09 ☐ Operations
10 ☐ Production
11 ☐ Education/Training
12 ☐ Marketing/Sales
13 ☐ Medical/Legal
14 ☐ Admin./Mgmt.
4. Is your company a reseller?
01 ☐ Yes 02 ☐ No

5. For how many nodes do you specify brands of networking products?
01 ☐ 10 or less 03 ☐ 26-99
02 ☐ 11-25 04 ☐ 100 or more
6. Do you plan to buy any network products:
01 ☐ Now 03 ☐ in 7-12 mos.
02 ☐ in 4-6 mos. 04 ☐ no plans
7. Please indicate the connections currently installed or planned for installation within the next 12 months at your current business location:
- | | |
|---|---|
| Installed | Planned |
| 01 ☐ LAN to LAN | 04 ☐ LAN to LAN |
| 02 ☐ LAN to Host | 05 ☐ LAN to Host |
| 03 ☐ LAN to WAN | 06 ☐ LAN to WAN |
8. Number of employees in your entire company and at the site where you work:
- | | |
|--|--|
| Entire Company | At This Location |
| 01 ☐ 25 or less | 01 ☐ 25 or less |
| 02 ☐ 26-99 | 02 ☐ 26-99 |
| 03 ☐ 100-499 | 03 ☐ 100-499 |
| 04 ☐ 500-999 | 04 ☐ 500-999 |
| 05 ☐ 1000 or more | 05 ☐ 1000 or more |

Name

Title

Telephone

Company Name

Address

City

State

Zip

☐ Please send me a one-year (22-issue) subscription to PC Magazine for \$34.94 (U.S. price); all other countries add \$36.00 for additional postage.

PC 9/27-1

PC MAGAZINE *Welcome... to the Network Section!*

Circle the numbers below corresponding to products featured in the Network Section only. Use reader service card in the back of book to obtain information on other products. Fill in your name and address and answer the questions below. Manufacturers will mail FREE product literature to you.

Valid after January 31, 1995

FREE NETWORK PRODUCT INFORMATION REPLY CARD

820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849
850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879
880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909
910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939
940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969
970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999

1. Do you work in a DP/MIS dept.?

01. ☐ Yes 02. ☐ No

2. Please indicate your company or organization's primary business activity: (Check one)

01. ☐ Manufacturer Computer Equip., Computers, Software

02. ☐ Manufacturer-Aerospace

03. ☐ Manufacturer-Other

04. ☐ Systems House

05. ☐ Computer Consultant

06. ☐ Computer Retailer/VAR/VAD Distributor

07. ☐ Communications

08. ☐ Finance/Banking/Insurance/Real Estate/Accounting

09. ☐ Education

10. ☐ Government

11. ☐ Research and Development

12. ☐ Data Processing/Computer Service

13. ☐ Health/Medical/Legal Service

14. ☐ Engineering/Architecture

15. ☐ Agr./Const./Mining/Oil/Transp./Utilities

16. ☐ Non-Computer Retailer/Dist.

17. ☐ Other Business or Service

18. ☐ Other Business or Service

19. ☐ Other Business or Service

20. ☐ Other Business or Service

21. ☐ Other Business or Service

22. ☐ Other Business or Service

23. ☐ Other Business or Service

24. ☐ Other Business or Service

25. ☐ Other Business or Service

26. ☐ Other Business or Service

27. ☐ Other Business or Service

28. ☐ Other Business or Service

29. ☐ Other Business or Service

30. ☐ Other Business or Service

31. ☐ Other Business or Service

32. ☐ Other Business or Service

33. ☐ Other Business or Service

34. ☐ Other Business or Service

35. ☐ Other Business or Service

5. For how many nodes do you specify brands of networking products?

01. ☐ 10 or less

02. ☐ 11-25

03. ☐ 26-50

04. ☐ 100 or more

05. ☐ 100 or more

06. ☐ 100 or more

07. ☐ 100 or more

08. ☐ 100 or more

09. ☐ 100 or more

10. ☐ 100 or more

11. ☐ 100 or more

12. ☐ 100 or more

13. ☐ 100 or more

14. ☐ 100 or more

15. ☐ 100 or more

16. ☐ 100 or more

17. ☐ 100 or more

18. ☐ 100 or more

19. ☐ 100 or more

20. ☐ 100 or more

21. ☐ 100 or more

22. ☐ 100 or more

23. ☐ 100 or more

24. ☐ 100 or more

25. ☐ 100 or more

26. ☐ 100 or more

27. ☐ 100 or more

28. ☐ 100 or more

29. ☐ 100 or more

30. ☐ 100 or more

31. ☐ 100 or more

32. ☐ 100 or more

33. ☐ 100 or more

34. ☐ 100 or more

35. ☐ 100 or more

36. ☐ 100 or more

37. ☐ 100 or more

38. ☐ 100 or more

39. ☐ 100 or more

40. ☐ 100 or more

41. ☐ 100 or more

42. ☐ 100 or more

43. ☐ 100 or more

44. ☐ 100 or more

45. ☐ 100 or more

46. ☐ 100 or more

47. ☐ 100 or more

48. ☐ 100 or more

49. ☐ 100 or more

50. ☐ 100 or more

51. ☐ 100 or more

52. ☐ 100 or more

53. ☐ 100 or more

54. ☐ 100 or more

55. ☐ 100 or more

56. ☐ 100 or more

57. ☐ 100 or more

58. ☐ 100 or more

59. ☐ 100 or more

60. ☐ 100 or more

61. ☐ 100 or more

62. ☐ 100 or more

63. ☐ 100 or more

64. ☐ 100 or more

65. ☐ 100 or more

66. ☐ 100 or more

67. ☐ 100 or more

68. ☐ 100 or more

69. ☐ 100 or more

70. ☐ 100 or more

Name

Title

Telephone

Company Name

Address

City

State

Zip

☐ Please send me a one-year (22-issue) subscription to PC Magazine for \$34.94 (U.S. price); all other countries add \$36.00 for additional postage.

FOR QUICKER RESPONSE
FAX TO
(800) 025-0852

**FREE NETWORK
PRODUCT INFORMATION**

BUSINESS REPLY MAIL

FIRST CLASS MAIL PERMIT NO. 433 RIVERTON, NJ

POSTAGE WILL BE PAID BY ADDRESSEE



P.O. BOX 1687
RIVERTON, NJ 08077-8787

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES



What makes a smart modem smart?
For the answer to this and other communications questions, see this issue's Tutor column, which introduces you to the AT command set—the nearly universal language for PC modems.

User-to-User

BY NEIL J. RUBENKING

Creating Variables That Last

It's often convenient to pass the values of certain environment variables from one DOS session to another. My technique is to store a series of SET commands in a small batch file called AUTOPARM.BAT, which is executed by a CALL command in AUTOEXEC.BAT. The CALL command *must* include the .BAT extension.

Initially AUTOPARM.BAT contains only two lines:

```
FIND "SET %1="/V/I<%0>%0
IF NOT (%2)==() ECHO IF (%1)==()
SET %1=%2>>%0
```

To create a persistent environment variable WIN with the value YES, for example, AUTOPARM.BAT must be executed with two command line parameters, the variable name WIN and its value YES:

```
AUTOPARM.BAT WIN=YES
```

IN THIS SECTION

Tutor 291
Extending Your Apps 295
Toolkits 299
Power Programming 303
Utilities 311
Solutions 321

Again, the .BAT extension is necessary.

The first line of the batch file strips out any previous lines that set the value of WIN. The second line appends a new line to the batch file that will set WIN to YES when the modified version is executed with no parameters. Any other lines remain unchanged. After this line, AUTOPARM.BAT has a third line that reads

```
IF (%1)==() SET WIN=YES
```

This procedure can be repeated for any number of variables. You can use it to create new variables or to change the value of existing ones. To remove a variable from AUTOPARM.BAT, execute it with just the variable name on the command line. For example, to remove the variable WIN, just type

```
AUTOPARM.BAT WIN=
```

Put the line CALL AUTOPARM.BAT at the beginning of your AUTOEXEC.BAT. You can then use the variables AUTOPARM creates for decision making in AUTOEXEC.BAT—for example,

```
IF (%WIN%)==(YES) C:\WINDOWS\WIN
```

If I want to work in Windows, I'd simply type AUTOPARM.BAT WIN=YES, and from then on AUTOEXEC.BAT would automatically load Windows. If I decided to boot directly into DOS, all I'd have to do is type AUTOPARM.BAT WIN=NO. No change to AUTOEXEC.BAT would be necessary.

Joseph A. Grela
Mamaroneck, New York

►PC MAGAZINE: You may find AUTOPARM.BAT more useful if you change its second line to

```
IF NOT (%2)==() ECHO SET %1=%2>>%0
```

Now when AUTOPARM.BAT expands itself with a line like SET WIN=YES, that line will be executed immediately. The

```
@ECHO OFF
IF (%1)==() GOTO Action
IF NOT EXIST %0 GOTO TryBat
FIND "SET %1="/V/I<%0>%0
IF NOT (%2)==() ECHO SET %1=%2>>%0
GOTO Action
:TryBat
IF EXIST %0.BAT GOTO AddBat
ECHO Either execute %0 from the current directory
ECHO or spell out its full pathname.
GOTO Action
:AddBat
FIND "SET %1="/V/I<%0.BAT>%0.BAT
IF NOT (%2)==() ECHO SET %1=%2>>%0.BAT
:Action
```



Figure 1: AUTOPARM.BAT is like a SET command with a memory; the variables you create with it are re-created every time it runs.

original AUTOPARM.BAT doesn't create any environment variables until it is executed a second time with no command line parameters. The modified version of the batch file acts more like a SET command for persistent environment variables. Note that the equal signs shown in the AUTOPARM.BAT command line examples are completely ignored by DOS. They're treated as nothing more than command separators, like spaces or tab characters. They do, however, serve to emphasize AUTOPARM.BAT's similar-

MONARCH. A NEW WAY TO ACCESS CORPORATE DATA.

Now PC users can get their hands on corporate data, without burdening the MIS department, or tying into the central database.

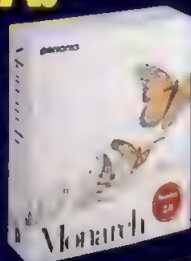
Introducing Monarch™, a unique PC application that uses *existing computer reports* as a source for data. Monarch extracts data from report files downloaded from any mainframe, mini or PC. Instantly, the reports come alive on your screen, so you can look things up, boil things down, get totals and subtotals, all at electronic speed. And you can send report data to applications like dBASE and 1-2-3. Call today for your free demo disk.

1-800-445-3311

personix
A DATAWATCH COMPANY

(508) 658-0040 FAX (508) 988-0105

**CALL FOR
FREE
DEMO**



CIRCLE 026 ON READER SERVICE CARD
NOW AVAILABLE AT

EGGHEAD SOFTWARE

PC TECH

User-to-User

ity to the SET command.

The %0 parameter in both lines of AUTOPARM.BAT is replaced at run-time by the exact command used to load AUTOPARM.BAT. That's why it's necessary to include the .BAT extension. In addition, if AUTOPARM.BAT isn't in the current directory, you must spell out its full pathname (for example, CALL C:\BAT\AUTOPARM.BAT). Figure 1 is a slightly more forgiving version of AUTOPARM.BAT. You can call it with or without the .BAT extension, and you can call it from another disk drive by prefixing the drive letter to the command (for example, D:AUTOPARM=).

You can download AUTOPARM.BAT from PC MagNet's Utilities/Tips Forum archived as AUTOPA.BAT.

Uninstalling DOS 6 Correctly

If you install DOS 6.x and later decide to remove or replace it with a different version of DOS, you may receive an error message whenever you start up Windows. The error message complains that a file needed to run Windows may be missing. Here's why:

When you upgrade to DOS 6.x and install the Windows version of MSBackup, an entry will be added to your SYSTEM.INI file. This entry is in the [386Enh] section of SYSTEM.INI and looks something like this:

```
device=C:\DOS\VFINTD.386
```

VFINTD.386 is a special file that comes with DOS 6.x but works with Win-

Windows will look for the VFINTD.386 file in your path and will display an error message when it can't find the file. To eliminate the error message, load your SYSTEM.INI file (found in your Windows directory) into any text editor and remove the device=c:\dos\VFINTD.386 line. Save the SYSTEM.INI file, then exit and restart Windows. The error message should no longer appear.

*Lisa Monitto
New York, New York*

► **PC MAGAZINE:** The DOS 6.x SETUP program can make several changes to your Windows .INI files, but it's very conscientious about documenting them. Figure 2 shows the lines inserted by SETUP to install the VFINTD.386 device mentioned above. Note the comment lines before and after the actual device= line. When you remove DOS by using the Uninstall disk created by SETUP, Uninstall uses those comments to undo the changes to your .INI files.

The problem occurs if you delete or modify the comments in the .INI files, remove DOS 6.x manually, or install another DOS version over DOS 6.x. In that case, removing the reference to VFINTD.386 is just one of the steps required to clean up your Windows installation. You'll also need to delete the Microsoft Tools Program Manager group created by SETUP to hold the DOS 6.x tools. After deleting the group, load PROGMAN.INI into Notepad and then remove the now-pointless comment lines.

Next load WINFILE.INI into Notepad and remove the line UNDELETE.DLL=C:\DOS\MSTOOLS.DLL from the [Settings] section and the line MS-DOS

```
----- MS-DOS 6 Setup Modification - Begin -----
device=C:\DOS\VFINTD.386
----- MS-DOS 6 Setup Modification - End -----
```

Figure 2: DOS 6.x's SETUP program can make change to your Windows .INI files, but it documents them with comments like these.

dows (VF stands for *virtual floppy*). Its purpose is to enable you to use your floppy disk drives (for backup, among other things) while you multitask other programs that access another drive.

If you have removed the DOS 6.x directory, this feature is no longer available.

Tools Extensions=C:\DOS\MSTOOLS.DLL from the [AddOns] section. (Yes, it says "Extensions." Apparently Microsoft didn't take the time to run SETUP through a spell-checker.) When you restart Windows, all traces of DOS 6.x will be gone. □

Tutor

BY JEFF PROSISE

Your Modem's Language: The AT Command Set

Quick, what is this string for:

```
ATZ E1Q0V1X4&C1&D2S7=60
S11=55S0=0
```

If you recognized this rather cryptic-looking string as a command to initialize a modem, give yourself a pat on the back. To experienced PC users, the tipoff is the leading AT, which is short for *attention*. The letters and numbers that follow are members of the *AT command set*, which is a nearly universal language spoken by PC modems. If you use a communications program, go to the modem-settings screen, and you'll probably see a similar string under the heading Modem Initialization, Init Command, or something similar. Each time your comm software starts, it outputs this command to your modem to make sure that the modem is in a known state.

The AT command set was invented by Hayes Microcomputer Products, the folks who introduced the intelligent modem. Prior to intelligent modems, modems were inherently dumb devices. Even seemingly simple actions such as answering a call from another modem required some fancy footwork on the part of the communications software. Hayes designed and manufactured a family of modems, appropriately dubbed Smartmodems, that accepted high-level commands from the user, reducing common tasks such as dialing, answering, and hanging up to simple

commands transmitted to the modem in the form of ASCII text strings. The AT command set is now a de facto standard in the industry. If a modem is Hayes-compatible, you can be sure that it supports the AT command set.

AT commands vastly simplify the interface between communications programs and modems, but they can still be intimidating to a user who is unfamiliar with them. The initialization command above contains no fewer than ten different commands that control various aspects of the modem's operation.

(Modems typically accept command strings up to 40 characters long, not including the AT at the beginning of the command, so commands can grow quite long.) To understand the meaning of the command, we must break it down into its constituent parts.

AN OVERVIEW Figure 1 lists the core of the AT command set (to conserve space, a few of the more esoteric commands are not listed). The set has grown and expanded over the years, and many modems support additional commands not shown here. The commands listed in Figure 1 are supported by just about every Hayes-compatible modem manufactured in the last five or six years.

The granddaddy of them all is the AT command, which precedes virtually all other modem commands. The only commands that aren't preceded by AT are A/, which repeats the previous command, and +++, which takes the modem from on-line state to command state. In on-line state, an intelligent modem doesn't accept commands; it assumes all the characters sent to it constitute data to be transmitted and obligingly passes them through to the modem at the other end. A second of silence (a period of time during which no characters are transmitted) followed by the characters +++ and another second of silence switches the modem from on-line state to command state so that it will accept commands. This is known as performing an on-line escape. Both the characters used in the escape and the length of the *guard time*—the period of silence before and after the characters are transmitted—are user-

configurable. The command O0 (preceded by AT, of course) switches the modem back to on-line state.

The D command dials the phone and is typically accompanied by other commands known as *dial modifiers*. A simple dial command consists of the letters ATDT. The D stands for dial, and the T is a dial modifier that tells

the modem to use Touch-tones. If your phone system accepts only rotary (pulse) dialing, you would use ATDP instead. The command

```
ATDT5551212
```

tells a modem to dial 555-1212 using Touch-tones. Figure 1 lists other dial modifiers. One of the more useful ones is the comma, which induces a pause in the dialing process; by default, this pause is 2 seconds long. The command

```
ATDT9,5551212
```

causes the modem to dial an access code

AT commands vastly simplify the interface between communications programs and modems, but they can still be intimidating to a user who is unfamiliar with them.

The AT Command Set

CONTINUES

Command	Meaning	Comments
Prefix and repeat commands		
AT	Inform the modem that a command is coming.	Stands for <i>attention</i> and prefaces virtually all modem commands.
A/	Repeat the previous command.	Does not need to be prefaced with AT.
Commands to control the on-line state		
+++	Switch the modem from on-line state to command state.	Also known as the escape code and must be preceded and followed by a <i>guard time</i> of silence, which is 1 second by default. Otherwise, the plus signs are interpreted as data to be transmitted rather than an escape code. The guard time duration is determined by the setting of the S12 register. To use a different character triplet for this command, write the new character code to the S2 register.
00	Switch to on-line state.	Usually used to return to on-line state after an escape code switches the modem to command state.
Commands to dial, answer, and hang up		
A	Answer the phone.	Used to answer the phone manually.
D	Dial the phone.	Normally accompanied by one or more dial modifiers (see below).
H0	Hang up the phone.	
H1	Pick up the phone.	Equivalent to picking up the telephone (letting up the switch hook).
Dial modifiers (used in conjunction with the D command)		
P	Pulse dial the phone.	Simulates dialing with a rotary phone.
R	Originate the call in reverse and switch to answer mode.	Useful for dialing originate-only modems.
T	Tone dial the phone.	Simulates dialing with a Touch-tone phone.
W	Wait for a second dial tone before continuing.	Useful when you must dial an access code and wait for a second dial tone before continuing. The maximum wait time for the second dial tone is specified in the S7 register.
,	Pause for 2 seconds while dialing.	Can be changed by modifying the value in the S8 register.
!	Flash the switch hook.	Simulates a tap of the switch hook prior to transferring a call.
/	Pause for 1/8 second while dialing.	
@	Wait for 5 seconds of silence before continuing.	Useful when dialing phone systems that do not provide a dial tone. The maximum wait time is specified in the S7 register. By default, most modems will wait anywhere from 30 to 60 seconds for the 5 seconds of silence.
;	Return the modem to command mode after dialing.	
Commands to control the modem speaker		
L0	Select very low speaker volume.	L0 and L1 produce the same result on many modems. To disable the speaker, use the M0 command.
L1	Select low speaker volume.	
L2	Select medium speaker volume.	
L3	Select high speaker volume.	
M0	Shut off the speaker.	
M1	Turn on the speaker but turn it off when a connection is established.	
M2	Turn on the speaker.	
Commands to control result codes		
Q0	Send result codes.	Responds to commands transmitted to it by sending result codes to the host PC.
Q1	Do not send result codes.	
V0	Select numeric result codes.	Transmits numeric result codes to the host PC.
V1	Select textual result codes.	Transmits text-string result codes to the host PC. Many communications programs use this setting and echo the result codes to the screen.

Figure 1: These commands form the core of the AT command set. Most modems support at least the commands listed here, and many support additional commands that are specific to a particular brand or model. The meanings of some commands vary slightly across product lines.

of 9, pause for 2 seconds, and then dial 555-1212. This is handy if there is a brief pause after the access code is dialed but before a dial tone is heard. Another way to handle this is with the W dial modifier, which is used like this:

ATDT9W5551212

With a W in place of the comma, the command would tell the modem to pause until it hears a second dial tone.

The A command tells the modem to answer an incoming call. Most modems will automatically answer calls if configured to do so—a feature known as *auto-answer*. The A command is useful when auto-answer is disabled. If the phone rings, type ATA, and the modem will pick up. ATH0 disconnects the modem from the line and is equivalent to hanging up the phone.

Most modems contain small speakers. Speakers can be controlled with L and M commands. The L commands adjust the speaker volume; the M commands turn the speaker on and off. The M commands have precedence, so no matter what level you set the speaker volume to with an L command, no sound will be heard if the speaker has been turned off with an M command. The M1 command is a favorite of many users. You hear the modem dialing and attempting to connect with a remote modem, but as soon as a connection is established, the speaker clicks off, sparing you the nonsensical noise of data transmissions. This setting is in fact the default on many modems.

Communications between a PC and a modem is not a one-way street. If you like, a modem can respond to commands from the PC by transmitting *result codes* through the serial port. The Q command enables and disables result codes, and the V command controls the format, or the *verbosity*, of the result codes. Suppose you've instructed your modem to dial a number. If result codes are activated and the numeric format is selected, the modem will send a 0 to acknowledge that it received the command and a 1 when a connection is established. If text result codes are selected, the modem will respond with the text strings "OK" and "CONNECT". Numeric results are useful for communications programs that

The AT Command Set

ENDS

Command	Meaning	Comments
Commands to control S-register settings		
<i>Sn?</i>	Retrieve the value stored in S-register <i>n</i> .	For a list of S-registers and their meanings, see Figure 2.
<i>Sn=m</i>	Copy the value <i>m</i> to S-register <i>n</i> .	
Other modem commands		
B0	Use CCITT protocols.	Applicable only at 300 and 1,200 bps. Some modems do not support the 300 bps CCITT protocol (V.21).
B1	Use Bell protocols.	Applicable only at 300 and 1,200 bps.
E0	Disable command echo.	
E1	Enable command echo.	Echoes every command character back to the sender.
F0	Select half-duplex operation.	
F1	Select full duplex operation.	
X0	Do not wait for a dial tone before dialing and do not report busy signals.	Affects the range of result codes that the modem returns.
X1	Same as X0 but with a slightly expanded range of result codes.	
X2	Wait for a dial tone before dialing but do not report busy signals.	
X3	Do not wait for a dial tone before dialing but do report busy signals.	Useful if your modem has difficulty recognizing the dial tone on your phone system.
X4	Wait for a dial tone before dialing and report busy signals.	
Y0	Disable long space disconnect.	Configures modem to neither send nor respond to break signals.
Y1	Enable long space disconnect.	Configures modem to send break signal on disconnect and to disconnect if it receives a break signal whose duration is at least 1.6 seconds.
Z	Reset the modem to its power-up defaults.	The software equivalent of turning the modem off and on.
Selected ampersand commands (full set not shown)		
&C0	Always assert DCD (data carrier detect).	
&C1	Only assert DCD while connected to a remote modem.	
&D0	Ignore the state of DTR (data terminal ready).	
&D1	Switch from on-line to command state when DTR goes from on to off.	
&D2	Hang up and switch from on-line to command state when DTR goes from on to off.	
&D3	Reset the modem when DTR goes from on to off.	Some modems do not support &D3. On these, &D2 is equivalent to &D3.
&F	Restore factory default settings.	Similar to the Z (reset) command.
&R0	Assert CTS (clear to send) only when RTS (request to send) is asserted.	
&R1	Always assert CTS.	
&S0	Always assert DSR (data set ready).	
&S1	Assert DSR only when in on-line mode.	
&W	Save current configuration settings in nonvolatile memory.	&W and &Z allow a preferred modem configuration to be saved and restored.
&Z	Reset the modem and recall configuration settings from nonvolatile memory.	

wish to interpret result codes, while text results are useful for programs that wish simply to display result codes on-screen. Many comm programs use the latter technique to provide visual feedback to the user.

A special class of commands, called *ampersand commands*, allows you to con-

trol certain aspects of the modem's handling of RS-232 (the standard interface through which PCs communicate serially with peripherals). The command `AT&S0`, for example, tells the modem to leave the DSR (data set ready) line asserted at all times. With normal comm programs this isn't necessary, but if you have a utility

that uses BIOS (Basic Input/Output System) output routines to transmit modem commands, it may be necessary for the modem to assert DSR. In general, you shouldn't need these commands except in special circumstances. Ampersand commands are not supported on older modems, so you can't count on them being there.

Space doesn't permit us to examine all the remaining members of the AT command set, but by now you should get the idea. See Figure 1 for information on other commands. The ultimate reference is of course your modem manual, which should list all the commands supported by your modem's particular make and model.

THE S-REGISTERS Hayes-compatible modems have built-in storage locations called *S-registers*, which store important configuration information. Like bytes of RAM in a PC, these registers can be programmed with values from 0 to 255. Figure 2 lists the subset of S-registers that is common to nearly all modems.

Many aspects of a modem's operation are programmable, and many of the programmable features are controlled through the S-registers. The on-line escape character, which is usually the plus sign described earlier, can be changed to another character by writing another ASCII character code to register S2. The length of the guard time surrounding the transmission of an escape code can be changed through register S12.

You can experiment with different S-register settings and determine the registers' current settings by entering S commands in your comm program. The command `ATSn?` displays the value currently held in S-register *n*, while `ATSn=m` copies the value *m* to S-register *n*. Call up a communications program and type

ATS8?

and the communications program will display the number of seconds that your modem will wait to make a connection after dialing out—the value in register S8. (When entering modem commands from the keyboard, you'll probably want to set your communications software to half-duplex mode so that characters will be dis-

S-Registers

Register	Defines	Comments
S0	Number of rings to wait before answering an incoming call.	Setting this register to 0 disables auto-answer.
S1	Signal quality/number of rings.	Reading this register while connected to another modem gives a numeric indicator of signal quality. Reading it while the phone is ringing tells you how many rings have occurred.
S2	Escape-code character.	Default is ASCII 43 (plus sign).
S3	Carriage-return character.	Default is ASCII 13.
S4	Line-feed character.	Default is ASCII 10.
S5	Backspace character.	Default is ASCII 8.
S6	Number of seconds to wait for a dial tone before dialing.	
S7	Number of seconds to wait for carrier connection before hanging up.	The same value determines the number of seconds the modem will wait following V.
S8	Pause time induced by comma.	Default is 2 seconds on most in dial command modems.
S9	Length of time a carrier must be present before the modem will recognize it as a carrier.	Units are tenths of a second.
S10	Delay between carrier loss.	Higher values for this register and automatic disconnect may help if you have a noisy phone line. Units are tenths of a second.
S11	Duration and spacing of Touch-tones when dialing.	Units are milliseconds.
S12	Escape-code guard time.	Units are fiftieths of a second. Default is 1 second on most modems.

Figure 2: The S-registers hold values that control various aspects of a modem's operation. These are the core S-registers implemented on nearly all modems. Most modems contain additional, model-specific registers.

played as you type them. As an alternative, you can run the software in full-duplex mode and send the modem an E1 command so that the modem itself echoes the characters.) Conversely, if you entered

```
ATS8=15
```

the value would be set to 15 seconds.

THE SUM OF THE PARTS Now let's go back and take a closer look at that initialization command at the beginning of this article. The command

```
ATZ1Q0V1X4&C1&D2S7=60S11=55S0=0
```

can be broken down into the following components:

- AT leads off the command, serving as a signal to the modem that a command is forthcoming. The modem buffers all incoming command characters until a ter-

minating carriage return is received and then begins to act on the contents of the buffer.

- Z resets the modem to its defaults. Z is often used in initialization strings to erase previous settings prior to instituting new ones.
- E1 tells the modem to echo commands back to the PC.
- Q0 configures the modem to respond to each command with a result code. Q stands for quiet. Q0 means quiet off and Q1 means quiet on, or do not send any result codes.
- V1 configures the modem to transmit result codes in the form of text strings.
- X4 tells the modem to sense dial tones and busy signals. In this mode, the modem will not dial until it hears a dial tone and will report back with the re-

sult code "BUSY" (or its numeric equivalent) when it detects a busy signal.

- &C1 configures the modem to assert DCD (data carrier detect) while connected to a remote modem. The alternative is &C0, which permanently asserts DCD. Some software won't communicate with a modem unless DCD is asserted and therefore won't transmit commands to the modem unless the modem was initialized with &C0. Such software is becoming increasingly rare.
- &D2 configures the modem to perform either a full or a partial reset depending on the modem's make and model if the DTR (data terminal ready) line makes an on-to-off transition during a communications session.
- S7=60 writes the value 60 to the S7 register. The value in S7 specifies how long the modem will wait for a connection after dialing is completed. S7=60 sets the maximum wait time to 60 seconds. If for any

reason, a connection cannot be established in this length of time, the modem hangs up and sends back a "NO CARRIER" result code.

- S11=55 sets the duration of and spacing between Touch-tones to 55 milliseconds by writing 55 to the S11 register. Higher values will slow down the dialing process, while lower values will speed it up. The setting S11=55 produces speedy dialing.
- S0=0 disables auto-answer by writing a 0 to the S0 register. A nonzero value in this register specifies the number of rings that the modem should wait before answering incoming calls.

These commands could be issued separately, each preceded by AT and followed by a carriage return. Most communications programs support only one initialization string, however, so if you want to issue several initialization commands, you must lump them into one. Using the command letter alone is equivalent to using it with the zero suffix. Issuing E, for example, has the same effect as issuing E0.

THE CHICAGO UNIMODEM DRIVER Ten years ago, AT commands were a god-send to communications programmers, because they made writing comm programs vastly easier. Moreover, because the AT command set became an unofficial standard, it enabled the same program to work with a variety of different modems.

As a user, however, you might find it hard to get excited about AT commands. There's nothing intuitive about long commands requiring reference manuals to decipher. Today, we have come to appreciate—and even expect—visual interfaces to our hardware and software. The next version of Microsoft Windows, code-named Chicago, will answer these expectations with a universal modem (known as UniModem) driver that obviates the need to enter AT commands. Instead of typing an L command as part of an initialization string, for example, you'll use your mouse to adjust a volume control in a modem control panel. The AT interface will still be there, but it will be hidden from us by the operating system. Stay tuned: In future columns, we'll discuss this and other exciting aspects of Chicago in detail. □

Extending Your Apps

BY BRIAN PROFFIT

Tuning Windows Applications Under Personal OS/2

OS/2 lets you run more applications than any other desktop operating system. That's because it can handle DOS, Windows, and OS/2 programs, singly or simultaneously.

Of course, emulating other platforms always adds overhead, so most DOS and Windows applications run more slowly on OS/2. This is most apparent if you are limited to a 386-based machine with 8MB of memory or less. OS/2's faster disk subsystem offsets much of this loss, however, and if you factor in the extra productivity gained by being able to multitask these applications, you're usually better off with OS/2. This is particularly true with the new Personal OS/2, which was specifically designed to improve performance on smaller systems. Personal OS/2 even lets you run with only 4MB of memory.

That said, however, while your DOS and Windows programs will usually perform reasonably well under Personal OS/2 without any intervention on your part, spending a little time to tune the settings for these applications can produce significant improvements in performance. These settings will affect not only the program being tuned but also all other applications that are running concurrently. In this column, I'll concentrate on Windows programs; next time, I'll look at the underlying DOS settings that can influence the performance of both DOS and Windows applications.

WINDOW PANES The decision that makes the most dramatic visual difference is whether you are going to run the pro-

gram in a full-screen session or in a window on the OS/2 desktop. For DOS programs under Windows, the difference between "in a window" and "full screen" is clear. For Windows programs under OS/2, however, the distinction is more subtle. Just as two pieces of fabric joined together with no visible separation are said to be seamless, OS/2 allows its programs and Windows programs to run side by side on your OS/2 desktop, creating a seamless connection of operating environments.

When you become accustomed to OS/2's graphical user interface (GUI), you will likely want to run everything from the OS/2 desktop, where you can minimize and restore the sessions at will. Unfortunately, this requires a lot of overhead, because OS/2 must manage a great deal of additional information about the session. The first rule, then, for tuning DOS and Windows applications under OS/2 is simple: Every program will run more quickly in what OS/2 calls full-screen mode. Here, full screen doesn't mean that the program's window must be maximized. Rather, it means that the Windows application is *not* seamlessly integrated with the OS/2 desktop. Windows applications will run fastest if you start the Windows desktop and run them from there rather than under the Win-OS/2 Program Manager.

Personal OS/2 improves the performance of seamless Windows applications considerably, however, with its Fast Load facility. This feature loads the Win-OS/2 overhead during the boot process so that when you are ready to start your Windows application, only the program itself needs to be loaded. Most of the start-up of Fast Load takes place after the OS/2 desktop is in place, so you can start other things at the same time. A second or 2 delay during boot-up won't make much difference, but when you double-click on your application without Fast Load, you'll notice every moment's delay.

As OS/2 now ships, Fast Load is off by default. IBM has indicated that it is considering changing the settings so that Fast Load will be on by default. Now, however, you must open the OS/2 System folder and the System Setup folder within that to activate Fast Load. You can then open the Win-OS/2 Setup Notebook and click on the Win-OS/2 Settings push button. Change the Fast Load setting to On, and the next time you boot-up your system, Fast Load will be active.

*You can produce
significant improvements
in performance for your
DOS and Windows
programs running under
Personal OS/2.*

DOS AND WIN-OS/2 SETTINGS The key to finer control over your DOS and Windows programs is the Settings Notebook, which lets you precisely determine the characteristics of the session in which you run your programs. If you simply load a program from a command line or the Program Manager, it runs with the

general default settings for those command sessions, which may not be best for that specific program. One of the strongest arguments for creating separate program icons for each of your applications is the ability to establish settings separately.

The easiest way to create separate icons for your programs is with OS/2's application *migration* facility. Migration in OS/2 terminology doesn't mean that you move your application from Windows to OS/2. It simply means adding a new icon for the application on the OS/2 desktop. With the new, separate icon, you can change the settings specifically for run-

■ Using More Memory Than You Have

OS/2 lets you load more programs than you have physical memory for. It does so by swapping parts of your data to disk when they aren't being used and then reloading them when they are needed. While this is handy, the more swapping you do, the more slowly your system will run, since hard disks are significantly slower than your computer's internal memory. Changing your settings so that less memory is used will usually reduce swapping and

ning the program under OS/2.

Open the OS/2 System folder and the System Setup folder within it and you'll find Migrate Applications. Open this program and you'll see the dialog box shown in Figure 1. Select the drive or directory that contains your DOS and Windows programs, and OS/2 will automatically detect the programs that you have installed there. You will be presented with a dialog similar to the one shown in Figure 2. The dialog box will contain all of the DOS and Windows programs OS/2 found.

When you now click on Migrate, the programs selected from this list will have icons created for them on the OS/2 desktop in folders labeled DOS Programs, Windows Programs, and Win-OS/2 Groups. Even better, those icons will have predefined settings that should work better than the system defaults. In other words, just by migrating the application to a desktop icon, you will also be speeding it up. That may be all that you need or want to do.

Note, though, that the only applications you can migrate will be those contained in the database that comes with OS/2. Thus, not all your programs may be found and migrated. For those not included, you'll want to drag a Program Template (found inside the Templates folder) onto the desktop to create your own desktop object for this program.

Whether your icon was created by migration or manually, you may want more direct control of the settings. This is especially true if you have less than 8MB or more than 12MB of memory and want to use it properly. To change the settings of any desktop object, click on the icon with

will consequently speed up your entire system.

On the other hand, if you have plenty of physical memory available and aren't running several programs simultaneously, your program may speed up if you allocate more memory to it. Your application's documentation should give you an idea how much memory it needs. You should give it all it needs but no more.

To help you decide, check the size

the left mouse button (unless you reconfigured OS/2 for left-hand mouse usage). This opens the object's pop-up menu. The top line should be Open. Click on the arrow beside Open and you'll get the secondary menu; clicking on Settings from that menu will open the Settings Notebook. The important functions are on the second page, so click on the right arrow at the bottom of the dialog to move to page two.

WINDOWS-SPECIFIC SETTINGS Most of the second page is devoted to establishing the type of application and whether it will run in a window or full screen. As indicated earlier, your program will run more quickly in full-screen mode, but a

of your SWAPPER.DAT file just after you start OS/2 and before you load any programs. If the file is already 6MB, you're in a heavy swapping situation and should be frugal when allocating memory (you should also consider adding memory to your machine). If, after loading a couple of your typical programs, this file is still 4MB or less, you can consider allocating more memory to those programs.

dows is the additional crash protection that OS/2 provides. Because each session runs in its own address space, if one Windows application crashes, that application won't bring down the rest of the system. Unfortunately, that adds a lot of overhead. If you are running more than one Windows program at a time, each has to have its own copy of the Win-OS/2 software. This adds several seconds to the program's load time and 2MB to the memory required.

You can, however, choose to run Windows applications in the same session. By doing so, all of the Win-OS/2 overhead is loaded with the first application. That first application must have enough memory al-

located for all Windows programs that will be loaded into that session. Use Fast Load to do this, since it acts as the first application and automatically ensures that subsequent applications can access the memory allocated in their own settings.

If the first application doesn't have separate session selected, subsequent Windows programs will be added to the

existing session without the delay and the additional memory needed for another copy of Win-OS/2. The downside to this is that now if any of those programs crashes, they can bring down the other Windows programs with them. OS/2, OS/2 programs, DOS programs, and Windows programs in separate sessions are all still protected.

The lower-level details can be accessed by clicking on the Settings push button to

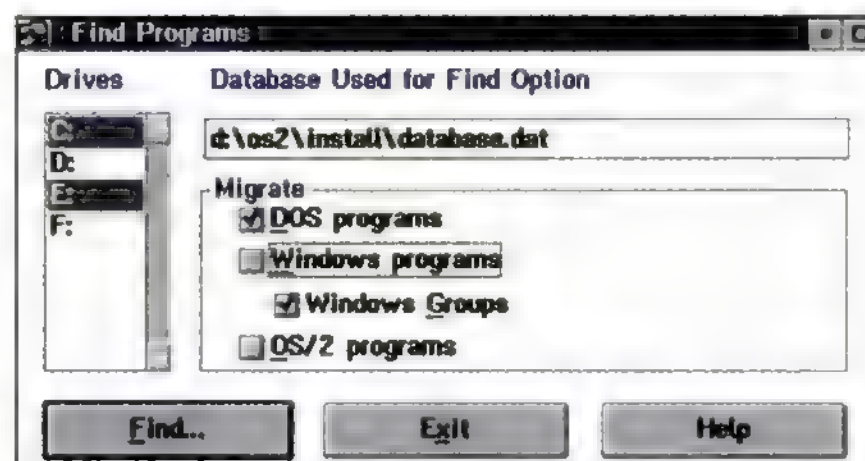


Figure 1: This shows OS/2's Migrate Applications program.

slight decrease in performance is a reasonable trade-off for the convenience of having everything on the desktop. If this is a Windows program, you have an additional decision to make here: whether to run this program in a separate session. Relevant considerations are discussed in the accompanying sidebar, "Using More Memory than You Have."

One advantage to running Windows applications under OS/2 rather than Win-

Hot off the Press!

**Software
Digest**

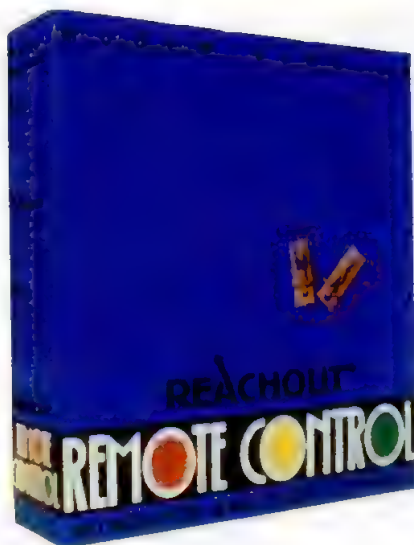
**Rated Number One
June 1994**



If you work away from the office, or need to provide remote support, get the product that's ideal in the field.

ReachOut Remote Control. It supplies the power to remotely control any PC running Windows or DOS. From anywhere. To anywhere. View a remote PC's screen in one Window while working locally in another Window. Use ReachOut's exclusive Remote Clipboard to cut and paste data between the two. Transfer files at record breaking speeds. Even synchronized files between two PCs.

ReachOut has earned three major awards in the past 18 months. The latest being "Product of the Year" for 1994 from LAN Magazine. Which goes to show that ReachOut is one powerful networking tool. InfoWorld proclaimed "ReachOut offers superb screen, mouse, and file transfer speeds and



Rated Number One In The Field

provides as many security options as Sing-Sing. Operation is as smooth as silk." InfoWorld rated ReachOut as #1 and awarded it their Buyer's Assurance Seal. And PC Magazine UK confessed ReachOut "was the only remote control program that worked right out of the box." They named ReachOut The Editor's

Choice and called it a top notch value. The new ReachOut

Version 4.0 for Windows continues the tradition of excellence with

support for all high resolution monitors up to 1280 by 1280 with 256 colors.

What's more, it makes no modifications to the Windows initialization files. And speed is as much as 40% faster than the

version InfoWorld had reviewed.

So don't settle for anything less than ReachOut. Call us toll free now for more information or for the ReachOut dealer nearest you. 1-800-677-6232. And then be the best in your field, with the best in the field.



1-800-677-6232

Ocean Isle

1201 19th Place
Vero Beach, Florida 32960 U.S.A.
Phone (407) 770-4777 Fax (407) 770-4779

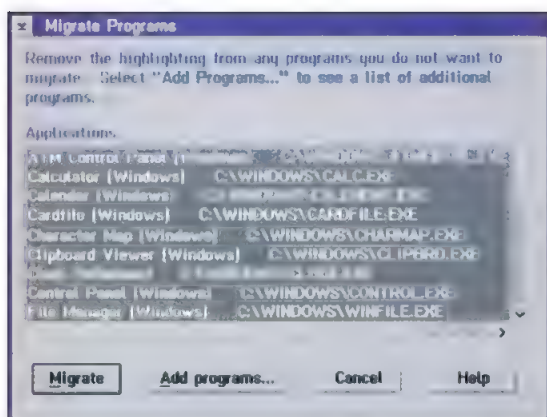


Figure 2: Here's how you select the applications to migrate.

bring up the list of all the changeable settings, as shown in Figure 3.

Rather than trying to discuss them all, let's focus here on the settings that most directly affect the performance of your program and of other programs running at the same time. The first four settings (OS/2 uses the same word for what you might call a setting parameter and its value) appear only for Windows programs. For reasons I can't fathom, IBM put the entire list in alphabetic order except for these important four:

- **WIN_RUN_MODE** (the default value is 3.1 Standard): With Version 2.1, OS/2 has eliminated one of the bigger restrictions of earlier versions: the inability to run programs that required Windows Enhanced mode. (The new OS/2 sacrifices the ability to run Real-mode programs, but little is lost since Windows 3.1 itself doesn't support those programs.) Enhanced sounds much more exciting than Standard, but don't give in to the urge to change the setting of all your Windows programs to Enhanced. Standard mode is actually faster in most cases where you have a choice. Of course, many current Windows applications require Enhanced mode, but don't use it where it isn't needed. Your application's documentation should tell you whether it requires Enhanced mode. If there is a question, just try running in Standard mode; if the program crashes, you'll know that it needs Enhanced mode.

Since Fast Load is an Enhanced-mode program, any applications that share its session may be Enhanced or Standard. If you're not using Fast Load and the application is being run in a shared session, you

should set it as Enhanced if any of the programs that share its session require Enhanced mode.

- **WIN_DDE** (default is Off): This setting determines whether you can establish Dynamic Data Exchange (DDE) links between Windows and OS/2 programs. Set this to On if you need DDE between program types, but doing this will add a lot of overhead, so don't change it unless you're sure you'll use it with this session.

- **WIN_CLIPBOARD** (default is On): A very congenial feature of OS/2 is its ability to cut and paste between Windows and OS/2 programs. If you're sure a particular Windows program won't be sharing data with OS/2 programs, you can get a slight performance boost by changing the setting to Off.

- **WIN_ATM** (default is Off): One of the differences between OS/2 and Windows is that OS/2 has standardized on Adobe Type Manager (ATM) fonts and Windows has standardized on TrueType fonts. By loading the ATM in your Win-OS/2 session, you can use the ATM fonts you have installed with your Windows applications as well. If you don't want to use ATM fonts in your Windows program, you can save the memory and the start-up time of loading ATM by leaving this setting Off. Providing this setting in Personal OS/2 gives you the ability to add the ATM overhead for specific Win-OS/2 sessions (such as a word processor) in which you need that function.

MAKING GLOBAL CHANGES If some settings seem appropriate for all of your Windows programs, you can make a global settings change by going to the Win-OS/2 set-up object. Open the OS/2 System folder and the System Setup folder within it and you'll find Win-OS/2 Setup. Opening that object reveals a notebook that looks much like the Settings Notebook. The difference is that changes made here apply to all Windows sessions. Use this facility sparingly. After all, the reason you migrated your applications to the desktop was so that you could establish different settings

for each of them.

I suggest you limit your activities here to the second page, where you establish whether DDE links and the Clipboard are private to Win-OS/2 or public (shareable) with OS/2 programs. If you are going to be sharing information between Windows and OS/2 applications, by all means take advantage of this outstanding feature. On the other hand, if you aren't going to be using these features, you should definitely change these settings to Private. This will greatly decrease the overhead required for Win-OS/2 sessions and speed up your Windows programs. Even if you are going to cut and paste between Windows and OS/2 programs, you can still set the DDE link to Private and get a nice performance improvement.

DON'T ASSUME IBM KNOWS BEST Migrating your applications will establish settings that OS/2 provides as a good starting point. Those settings, however, aren't necessarily the best for your particular system. Don't hesitate to tweak your settings in an attempt to improve performance. When you do, follow standard scientific procedure: Change only one setting at a time and then check for the effects. That makes determining which specific changes helped or hurt easier, and

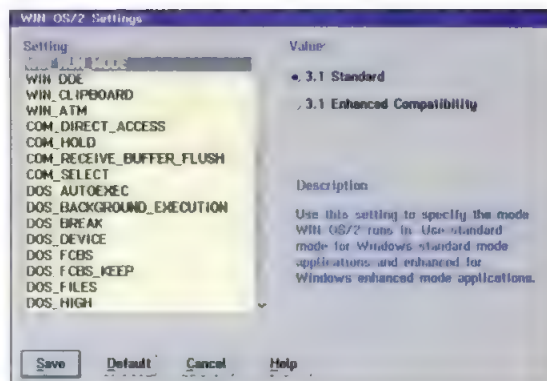


Figure 3: This shows how to change the Win-OS/2 settings.

you're more likely to remember what the original setting was when you decide to change it back.

You *can* make IBM's good thing even better. □

BRIAN PROFFIT IS A CONTRIBUTING EDITOR OF OS/2 MAGAZINE AND OS/2 DEVELOPER AND IS AUTHOR OF OS/2 APPLICATION DEVELOPMENT TOOLS (PREMIER PUBLISHING) AND OS/2 INSIDE & OUT (OSBORNE MCGRAW-HILL).

Toolkits

BY BOB FLANDERS

Write Fax Apps With VB

Writing a fax application involves more than simple data communications. It relies heavily on bitmapped graphics and data compression, the details of which are described in dense international-standards documents. Fax Plus, Version 1.07, a \$249 Microsoft Visual Basic custom control, from EllTech Development, frees you from having to learn all this by providing black-box fax capability. With Fax Plus, your programs can send or receive faxes, convert graphics-file formats to fax formats, and capture printer output for faxing at a later time.

GETTING GRAPHIC All data sent during a fax transmission is in a bitmapped graphics form defined by the international fax standard. Fax Plus stores fax-ready data in files with the extension .FAX and supplies functions for converting files between the .FAX format and the .BMP, .DCX, or .PCX formats. (A .DCX file contains multiple .PCX images.)

To send one or more .BMP, .DCX, or .PCX files as a fax, you first convert them to a .FAX file using Fax Plus's conversion function. Then you pass the name of the .FAX file and the phone number to the Send method of the control. Transmission can take place in the background while other processing continues. Receiving a fax works in a similar manner.

Since the fax standard is entirely graphical, to send text, you must first convert it to one of the supported graphics formats. This can be done either by using the Fax Plus printer driver or by writing the text to a Visual Basic PictureBox and

saving the picture. The resulting .BMP file must then be run through a Fax Plus conversion function to produce a .FAX file for transmission.

Fax Plus provides a printer driver to intercept printer output for faxing, but using it is somewhat awkward. The driver writes each page of information to disk as a .BMP file, and you are responsible for telling the driver what names to use for these .BMP files. This can be done in one of two ways: You can write a separate application to return .BMP filenames and include it in the output-device portion of the printer driver's profile string in WIN.INI. The driver will call this program each time it needs a .BMP filename. Alternatively, if the Fax Plus printer-driver custom control is present, the driver will call a particular method of this control each time it needs a .BMP filename. The custom control or separate program must supply multiple .BMP names for multipage output—a housekeeping task that should be transparently handled by the printer driver.

You can use any Windows application

to print the text to the driver, but you will probably want to write your own so that it can be incorporated into a complete fax application. When the driver informs the application that printing is completed, the application can then convert the .BMP file or files to a .FAX file for transmission. The company says that in future releases of the product, the printer driver will create .FAX files directly.

Perhaps the weakest part of Fax Plus is its documentation. The 84-page manual touches on all the major features, but explanations are sometimes inadequate. Often the only significant documentation is the uncommented sample program code. And while the sample programs demonstrate how to use all the features, you may have to search a bit to find code that applies to your situation.

The version of Fax Plus we reviewed supports only low-resolution faxes (203-by 98-dpi) and Class 2 fax modems. By the time you read this, an updated version will be available that adds high-resolution faxing and Class 1 fax-modem support. Though Fax Plus is occasionally awkward to use, it vastly simplifies the job of creating a fax application, and right now it is the only Visual Basic fax control on the market. □

► **Fax Plus, Version 1.07.** List price: \$249. Requires: 386-based PC or higher, 4MB RAM, 1MB hard disk space, Microsoft Windows 3.x, Microsoft Visual Basic 2.0 or higher or any language that supports .VBX custom controls. EllTech Development Inc., 4374 Shallowford Industrial Pkwy., Marietta, GA 30066; 800-553-1327, 404-928-8960; fax, 404-924-2807. Circle 441 in reader service card

OFF THE STACK

• **Lifeboat Publishing** has released Version 5.0 of the Essential Comm library (\$329), a C-based DOS library for communications programming. Essential Comm can manage all transmit and receive activity at rates of up to 115 kilobits per second. The new version adds support for new hardware and protected-mode programming. Full source code is included. Lifeboat Publishing; 617-273-0048.

Circle 443 on reader service card

• **Instant Information's** InstantCom//CAS (\$595) consists of two application programming interfaces (APIs) that let you develop Windows or DOS faxing applications for use with the Intel SatisFAXtion modem. The product supports the CAS API, as well as a proprietary API, which the company says is faster than CAS and simpler to use. InstantCom//CAS also supports up to ten fax boards in one computer. Instant Information Inc.; 503-692-9711.

Circle 442 on reader service card

CHOOSY BUYER

LET'S FACE IT, today's business computer market is no picnic. In fact, with so much competition, product advertisers are finding it increasingly important to reach committed business buyers without waste. So when buyers cite certain magazines—Ziff-Davis magazines to be exact—as their preferred choice for purchasing information, advertisers take note. And action.

Business buyers who are involved in selecting computer products for their companies have a weighty responsibility. They must choose wisely. Because the wrong system, software or peripheral can lead to costly, career-threatening mistakes today and down the road.

In over 60 independent studies since 1987, buyers cite Ziff-Davis magazines as their preferred choice for purchasing information.



These buyers need timely, objective news and reliable product evaluations to guide their purchasing decisions. Which makes them very choosy about where they get their information.

They know some publications meet their needs better than others. Those are the ones they turn to first, trust the most and spend the most time reading.

Independent studies confirm that buyers prefer Ziff-Davis magazines.

In more than 60 independent studies conducted over the past six years, buyers have cited Ziff-Davis magazines as their number one choice for purchasing information. In many cases, Ziff magazines have been their choice by 2-to-1 or more over their nearest competitors.

Whether they've been selected at trade shows, from vendors' lists or

S CHOOSE ZIFF.



what better place is there for their messages to be seen and read? For the first 5 months of 1994, 46% of all advertising in major computer publications ran in seven Ziff-Davis magazines. The rest of the advertising was scattered among 15 other publications.*

Why do advertisers so overwhelmingly prefer Ziff-Davis magazines? Quite simply, they work. Advertisers know the magazines deliver those choosy business buyers who buy their products.

And to help them reach these buyers more effectively, we've created The Ziff-Davis Magazine Networks—an integrated, complementary set of publications that address every key person involved in the buying process.

So if you want to reach committed business buyers, choose the computer publications that business buyers choose first: Ziff-Davis magazines.

To learn more, call 212-503-5650.



from user groups, buyers have consistently named our magazines as "most useful", "most authoritative for labs-based product reviews" and "best at delivering timely news and analysis."

Top editorial, top labs.

Our popularity has been earned through the efforts of the largest, most distinguished editorial staff in the industry. Their unmatched technology and business solutions expertise has resulted in thousands of pages of

quality journalism to inform and assist buyers with their decisions.

And all of our editorial is supported by the extensive product testing that comes from four magazine-specific labs plus ZD Labs, the world's largest independent computer testing facility.

#1 with advertisers, too.

When you're number one with buyers, it's not surprising that marketers also make you first for advertising. After all,

ZD The Ziff-Davis
Magazine Networks

CIRCLE 354 ON READER SERVICE CARD



THERE ARE OVER 17 MILLION MICRO CHANNEL SYSTEMS OUT THERE. WE'RE HERE TO IMPROVE EVERY ONE.

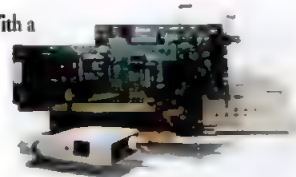
Give Your System a Room Addition.

Data Card provides all the memory and storage you need for Windows or OS/2 on one Micro Channel card to efficiently run today's GUI applications. Available with a 127 or 209MB hard drive and up to 64MB of system memory, Data Card coexists with your current hard drive and can be configured as the primary or secondary drive.



TokenRx Network Adapters Connect You With a Neighborhood of Micro Channel Users.

At \$375 retail, TokenRx includes IBM on-site service, IBM driver compatibility, IBM developed TROPIC chip, and Kingston value. Kingston's TokenRx is the ultimate Token Ring adapter from the world's leader in IBM-compatible upgrade products.



Building a Better System.

Kingston's IBM-designed SLC/Now! plus SX/Now!, 486/Now! and MCMaster processor upgrades increase existing Micro Channel system performance by as much as ten times. They provide the power needed for today's software, perform comparable to new systems and cost at least 70% less.



Reliability is the Foundation.

Kingston offers everything you need to upgrade your Micro Channel system. We know you wouldn't trust your system to just anybody. So we've set out to earn that trust. How? Kingston Reliability. Every Kingston Micro Channel upgrade is individually tested in the system for which it's designed prior to shipping and supported by free and comprehensive technical assistance.

Home Owner's Insurance- Authorized IBM Field Service.

As the world's largest manufacturer of IBM compatible upgrades, Kingston is proud to announce that authorized on-site service is now available directly from IBM for all Kingston upgrades installed in IBM systems under IBM warranty or service contract.



For More Information on Micro Channel Improvements.

If Kingston Micro Channel Upgrades sound like a solution for you, contact your distributor or Kingston at (800) 835-6575. We'll be happy to answer your questions and talk shop or discuss any of our other 1100 upgrade products.

[800]

Kingston
TECHNOLOGY CORPORATION

THE INSIDE NAME IN UPGRADES

17600 Newhope Street, Fountain Valley, California 92708 (800) 835-6575 (714) 435-2600 Fax (714) 435-2699

All Trademarks and Registered Trademarks are of their respective holders. Kingston and Kingston Technology are Registered Trademarks of Kingston Technology Corporation.

PC Magazine Circle 106 on Reader Service Card

Power Programming

BY MATT PIETREK

Which Win32 Is For You?

As I write this, Microsoft Windows 3.1 is still the king of the operating-system hill. Windows NT has been available for nine months and in many people's minds has flopped. The perception is that Windows NT is slow and a resource hog. Things don't look too bright for the future of 32-bit Windows programming. But like it or not, you'll still have to come face to face with the Win32 API if you want to stay in the Microsoft camp and keep up with the latest technologies. By all appearances, Microsoft is putting all its eggs in the Win32 basket.

Even though Microsoft will continue to support 16-bit Windows 3.x applications in future operating systems, 16-bit programs won't be able to take advantage of many new features. Given that Win32 is the future—at least, that's how Microsoft sees it—the big question is which Win32 implementation you should target. Windows NT and Win32s are already shipping. The next version of Windows (code-named Chicago) is in beta testing as is Windows NT 3.5 (Daytona). Further out on the horizon is the object-oriented Cairo operating system. Each of these operating systems qualifies as an implementation of the Win32 API.

This article will sort out and describe the differences among the various Win32 implementations. No doubt Microsoft won't like this, since its mantra has been "There's just one Win32 API. Write one program and it will run on all our systems." This sounds like a nice idea, but it breaks down in practice. First, we'll take a high-level view of Win32 and then go into development considerations and architectures of the various Win32 platforms. Al-

though Windows NT is available for several different CPUs, this discussion will be limited to Intel CPUs throughout.

THE MASTER PLAN Before describing the differences among the available Win32 implementations, we first need to look at Microsoft's goals. The term Win32 defines a set of operating-system functions (an *API*—application programming interface) that application programs can use to carry out their work. Since ease of porting to the Win32 API is important to Microsoft, the Win32 API is very similar to the Windows 3.x API in those areas that Win16 covers (for instance, window management and display output). When Microsoft first introduced the Win32 API several years ago, there was quite a bit of confusion between the terms Win32 and Windows NT. Windows NT is just one implementation of the Win32 API. Since Windows NT was the first announced implementation, people had a hard time discerning between the operating system and its API—Win32.

If Microsoft had limited the use of the Win32 API to just Windows NT, I wouldn't be writing this article. But Microsoft has implemented the Win32 API on several different operating systems. Each operating system is optimized for a specific situation. For powerful high-end machines, where robustness and security are issues, Windows NT is the implementation of choice. For low-end 386 machines with limited memory, using the

Win32s libraries with Windows 3.1 is the optimal Win32 implementation, at least until Chicago arrives.

The important point is that by writing your programs with any form of the Win32 API, you can theoretically run the same executable on any Win32 implementation. The Win32 API implementation in each operating system should gloss over any underlying differences in hardware or low-level operating-system design.

This all relates to Microsoft's "scalable architecture" campaign, promoted around the time of the first Win32 developer's conference in July 1992. As Win32's name implies, one of the key advantages of switching to the Win32 API from the Windows 3.x API is 32-bit code. The file format used for Windows 3.x and earlier programs is known as the *NE* (New Executable) format. The NE format is limited to 16-bit programs, since it has 16-bit fields scattered throughout its tables. In defining the Win32 API, Microsoft also outlined a new 32-bit executable file format. This format is known

Like it or not, you have to come face to face with the Win32 API if you want to stay in the Microsoft camp and keep up with the latest technologies.

as the *PE* (Portable Executable) format and is derived from the Unix System V COFF (common object-file format). The Win32 API and the Portable Executable format are a matched set. All Win32 operating systems use the Portable Executable format as their primary executable format.

By using the same executable format for all Win32 operating systems, Microsoft is able to guarantee that a properly written Win32 program will run on all Win32 implementations.

Shortly after knowledge of Windows NT became public, Microsoft announced another implementation of the Win32 API called Win32s. The idea behind Win32s is that a collection of DLLs and VxDs provided by Microsoft can be added to an existing Windows 3.1 machine to enable it to run Win32 programs. Unfortunately, some of the features that Windows NT brings to the party were not achievable under the architecture im-

posed by running atop Windows 3.1. Thus was born the concept of the Win32 subset. In fact, the *s* in Win32s stands for *subset*. The Win32s system provides some but not all of the API functions that Windows NT provides.

The major downfall of Win32s is that it doesn't support threads. Threads are a feature of advanced operating systems that allow more than one portion of a program to execute at once (or to give the appearance that this is happening). A classic use of threads is to use one thread to handle printing, while another thread continues to respond to user input. Win32s is also hamstrung by some limitations of Windows 3.x. More on this later.

More recently, Microsoft began beta testing the successor to Windows 3.1 and Windows for Workgroups. This operating system will be known as Windows 4.0 and as mentioned earlier is code-named Chicago. Like Win32s, Chicago provides only a subset of the full Win32 API as defined by Windows NT. Some people have dubbed this subset *Win32c*. The Win32c API subset includes all of the functions in Win32s and adds a significant number from the full Windows NT API set. Hopes are high for Chicago; it does contain most of the features that programmers like in Windows NT (for example, threads and separate address spaces). Another plus for Chicago is that it should require significantly less memory than Windows NT, making it a more suitable choice for the average desktop.

The Intel market is sufficiently large that Microsoft can have two mostly separate Win32 development efforts. Unlike in Windows NT, portability to other processors is not an overwhelming factor for the Chicago code. The Windows NT group produces a portable Win32 implementation but one that isn't optimal for any specific platform. Parallel to the Windows NT effort is the Chicago version of Win32, which is optimized for the Intel 80386 class of CPUs. If Microsoft didn't have a version optimized for the Intel platform, they'd likely lose ground to other operating systems that do, such as OS/2 2.x.

Recently, Microsoft sensed that there was growing confusion among programmers about the Win32 API and its subsets. To remedy this, they've begun stress-

ing that there's just one Win32 API and that a program written for the Win32 API will run on all the Win32 implementations. Programmers seem to be holding off on writing to the Win32 API, since they don't know which subset to target.

Trying to feather over the differences among API subsets is complete nonsense, of course. If a program relies on multiple threads to do its job, for example, there's no way that it can run on Win32s, since Win32s doesn't support multithreading. Programmers *will* have to pay attention to the Win32 subsets and will need to understand the underlying operating system if they want to program effectively.

A WIN32 OS METAPHOR I've come up with an analogy for the current Win32 platforms that makes their underlying architecture clearer. For the sake of discussion, pretend that audio compact disks don't yet exist and that the best form of recorded music is still cassette tapes. In this analogy, Win32 programs are cassette tapes, and 16-bit Windows 3.x programs

an eight-track player, letting you play cassettes in an eight-track player. Since there's an extra layer of electronics and tape heads between the eight-track player and the cassette tape, the quality isn't anywhere near as good as playing the cassette on a cassette deck. In Windows programming, Win32s is this cassette-to-eight-track adapter. You plug Win32 programs into the Win32s adapter, which in turn plugs into Windows 3.1 (the eight-track player). Also, when using these tape adapters, you're limited in what you can do. For instance, you can't use an eight-track adapter to record onto a cassette tape. Likewise, Win32s has limits on what it can do: The full Win32 API isn't supported nor are features like threads available.

Where does Chicago fit in? Chicago would be your basic cassette deck, with some components scrounged from an eight-track player. Chicago has a lot of new 32-bit code but also borrows heavily from the Windows 3.1 code base for

Win32 Platform Advantages and Disadvantages

Operating system	Advantages	Disadvantages
Windows NT 3.1	Very stable, C2 security, Unicode (2-byte characters), versions exists for other CPUs.	Requires fast CPU and much memory 16-bit Windows applications run slower than in Windows 3.1.
Daytona (Windows NT 3.5)	Same as NT 3.1 but runs faster and requires less memory. Adds Open GL graphics, multiple WOW sessions. 16-bit programs run faster than in NT 3.1.	Still requires a fast machine and more memory than the average desktop PC.
Chicago (Windows 4.0)	Runs in much less memory than Windows NT and can run on the average desktop PC. Improved user interface. Supports Plug and Play hardware and long filenames.	Not as robust as NT. Doesn't implement the full Win32 API. Badly behaved 16-bit programs can still prevent other programs from running.
Win32s	Runs in very little memory. Doesn't require Windows 3.1 users to upgrade to a new operating system.	Many NT and Chicago features (such as threads) are missing. Many 64K limitations just as there are in Windows 3.1.

Figure 1: Here are the major differences among the several flavors, present and future, of Microsoft's Win32 implementations.

are older, clunkier eight-track tapes. A Win32 operating system is a cassette-tape player that can both play and record. Windows 3.x is an eight-track player and is limited to playing eight-track tapes.

If you wanted the top-of-the-line stereo components, you'd purchase a high-quality cassette deck. That is, you'd get Windows NT. On the other hand, if you're strapped for cash and have only an eight-track player but want to play cassette tapes, what do you do? There are cassette adapters that plug directly into

things like window management. For the most part, the Chicago cassette deck does everything that the Windows NT premium-quality tape deck does but lacks some high-end features (for example, it doesn't support security or double-byte character sets—also known as Unicode—like NT does). On the positive side, the basic cassette deck doesn't require anywhere near the amount of fancy sophisticated electronics inside, so it is cheaper to produce. In other words, Chicago won't have nearly as much code as Windows NT, so it will

take up less room in memory and run faster.

THE WINDOWS NT IMPLEMENTATION

The primary goals of Windows NT are robustness and portability to other platforms. Much of the code is written in portable C or C++ rather than assembly language hand-optimized for the target platform. The emphasis on stability makes Windows NT an ideal development platform even if you're targeting Chicago, DOS, Windows 3.x, or Win32s. But portability and stability come at a cost. All of the C/C++ code in Windows NT adds up to around a 12MB footprint in memory just to get the system booted. A minimum Windows NT development

machine is a 486 with 16MB of memory.

Even with that hardware, Windows NT won't be as fast as a system running OS/2 2.x or Chicago.

One of the primary reasons for Windows NT's robustness is its protected-subsystem architecture. In the protected subsystem, the operating-system code that

implements the API functions runs in a process separate from the calling program's. The most important subsystem in Windows NT is the Win32 subsystem. The Win32 subsystem is its own process, with most of the USER and GDI code in a DLL called WINSERV.DLL. When your program makes a call to an API function like TextOut, you're not making a direct call to the real TextOut code. Instead, there's a stub in Windows NT's GDI32.DLL that copies your parameters into a region of memory that's accessible by both your process and the Win32 subsystem process. Your thread then signals the Win32 subsystem process that there's a function request waiting for it and goes to sleep. When the Win32 subsystem process sees the signal that there's work to do, it processes the request (for example, putting a text string to the screen) and then informs the calling process's thread that the function has completed. This subsystem client/server model applies to pro-

grams written to other operating-system APIs that Windows NT supports, such as OS/2 1.x and Posix.

The advantage of a protected subsystem is that its address space is better protected against memory overwrites and other bugs in program code. In operating systems without this subsystem model (such as Windows 3.x), the operating-system code and data is mapped into the address spaces of all processes, making it possible for a buggy program to overwrite and bring down the operating system.

The disadvantage of the subsystem model is longer execution time. Every call to an operating-system function theoretically causes a process switch and memory-

context change. This is expensive, clock cycle-wise, with estimates of 2,000 to 3,000 clock cycles for the average call. For this reason, the Windows NT developers optimized some heavily used routines so that they wouldn't require a process switch. In addition, certain GDI calls can be batched together so that there

isn't a process switch for each call.

While all this improved robustness for Win32 applications is great, what about existing 16-bit applications that run under Windows NT? These 16-bit Windows programs run under a cooperatively multitasking model and expect to be able to access memory belonging to other tasks. Windows NT keeps 16-bit tasks at arms length by running them in a separate subsystem known as WOW (Windows on Windows). All 16-bit Windows applications run in a single WOW box, which is essentially a multithreaded DOS box. The WOW box is a Windows 3.1-like sandbox in which 16-bit applications can do whatever they want without corrupting anything outside of it. The WOW subsystem communicates with the Win32 subsystem code to perform display output, allowing 16-bit and 32-bit Windows programs to interact on the same screen. I'm mentioning the WOW subsystem because it is an important architectural difference between Windows NT and Chicago or

Win32s. The only real downside to the WOW subsystem in Windows NT 3.1 is that 16-bit Windows applications run between 5 to 30 percent slower than they would on Windows 3.1.

THE WIN32S IMPLEMENTATION In contrast to Windows NT, Win32s is yet another layer on the already-shaky DOS and Windows house of cards. Windows 3.x is not a true operating system by itself. Rather, it rests on the unprotected real-mode operations of DOS. The code for implementing the Win32 API with Win32s adds another precariously balanced layer, because it relies on the VxDs and system DLLs from Windows 3.1. Win32s isn't an operating system itself: It's a set of extension libraries for Windows 3.1. With a few exceptions, if a function isn't in Windows 3.1, the equivalent Win32 function isn't in the Win32s subset.

Much of the Win32s code is nothing more than *thunks*. Thunks are the programming equivalent of patching things together with chewing gum, string, and bailing wire. In the case of Win32s, thunks are small chunks of code that handle the transition between the 32-bit code in the Win32s libraries and the 16-bit Windows 3.x code.

The limitations to Win32s are numerous. First, it doesn't support multithreading. Since Chicago and Windows NT do, this relegates Win32s to the abandon-as-soon-as-you-can category. Another flaw in Win32s is its single address space. Win32 programs running under Win32s can see the memory of other Win32 programs, as well as the memory of 16-bit programs, making memory corruption a very real possibility.

A third mark against Win32s is the lack of per-process DLL data. In Windows NT and Chicago, the data area of a DLL is instanced on a per-process basis (by default). In simpler terms, with Win32 you can safely use global variables in DLLs without worrying that another process will call the DLL and overwrite the variable. Since DLLs under Win32s share the same data area among all users of the DLL (just like under Windows 3.1), you can run into nasty bugs. Typically, your program and its DLLs will work fine under Windows NT or Chicago but crash in Win32s.

*Windows NT keeps
16-bit tasks at arms length
by running them in a
separate subsystem known
as WOW—Windows on
Windows.*

A whole new category of problems under Win32s relates to Win32s scheduling and the messaging system. In Windows NT, threads are switched preemptively. In addition, Windows NT gives each thread its own message queue, and a separate input-system thread assigns mouse and keyboard events to the appropriate queue. These two design factors allow one thread to be as unresponsive and take as much time as it wants without affecting other programs. In contrast, Win32s is stuck with the problem-prone Windows 3.1 cooperative-multitasking model. For one task to run, another task has to yield the CPU by calling a function like `GetMessage` or `PeekMessage`. If a Windows 3.1 or Win32s process doesn't retrieve its messages and yield the CPU in a timely manner, the user cannot switch to or use other programs.

On a positive note, Win32s does include a few nice Win32 features that the underlying Windows 3.1 code doesn't support. One of these extensions is *memory-mapped files*. Memory-mapped files allow you to map a section or all of a file to a range of linear addresses. To read or write to the file, you simply access the memory (in C/C++, you'd use pointers). Early versions of Win32s didn't have memory-mapped files, but later revisions include it.

The other nice feature brought over from Windows NT is *structured exception handling*. A full discussion of structured exception handling is beyond the scope of this article; for more on the topic, see the December 21, 1993, *Power Programming* column, "Making Exceptions with C++," by Kaare Christian. In brief terms, operating-system structured exception handling lets you define a handler function that will be called when a hardware or software exception occurs. Typical exceptions include access violations (also known as general protection faults) and the breakpoint interrupt (INT 3) used by debuggers. With the help of the compiler, this operating-system functionality can be extended to do something similar to the C++ try/catch mechanism. The C++ try/catch extensions allow programmers to simplify their code by allowing them to separate the code that's normally executed from the code that handles error conditions.

THE CHICAGO IMPLEMENTATION The best way to describe the Chicago Win32 implementation is that it's Win32s done properly. You can think of Chicago as the best features of Windows NT implemented in the Win32s style. Chicago contains just the right amount of advanced operating-system features without going overboard in terms of code size and execution time. Since Chicago will be Windows 4.0 when released, you can be sure that Microsoft considers Chicago to be its primary desktop Win32 operating system for the next several years.

Under the hood, Chicago has a stronger resemblance to Win32s than to Windows NT. Like Windows 3.1, the lowest layer of Chicago is ring-0 system code consisting of the Virtual Machine Manager and assorted VxDs. The code running at CPU ring-level 0 is theoretically the most stable and trusted code, so it has more access to the hardware and operating system data than the application-level code running at ring-level 3 of the CPU. Also as in Windows 3.1, there is one virtual machine set up for running Windows programs and a separate virtual machine for each DOS session you start. In the system virtual machine that's used by Windows programs are found the ring-3 system DLLs: the familiar USER, KERNEL, and GDI 16-bit DLLs, along with their 32-bit equivalents—KERNEL32, USER32, and GDI32.

Like Win32s, Chicago implements a big chunk of its code in the 16-bit system DLLs and uses thunks to transfer 32-bit programs down to the 16-bit code. Almost all of the windowing and messaging system code resides in the 16-bit USER.EXE just as it does in Windows 3.1. Trying to convert the massively complex windowing system code to 32 bits would have led to a large size increase and to incompatibilities with existing 16-bit programs. Neither of these problems is acceptable to Microsoft, so the windowing and messaging system in Chicago is essentially an updated version of the Windows 3.1 code. The updates are primarily to allow the 16-bit components of Chicago to interface with the 32-bit components that run Win32 programs.

The implementation of the 32-bit GDI API in Chicago is split between existing code in the 16-bit GDI.EXE and new

code in GDI32.DLL. Wherever possible and reasonable, the Chicago GDI32 functions thunk down to the existing 16-bit GDI code. In contrast, none of the KERNEL32 API functions thunk down to the 16-bit KRNL386.EXE. In this case, Microsoft apparently found the benefit of rewriting the KERNEL portions as 32-bit code to be worth the time and risk.

Earlier, I described some of the problems with Win32s: no threading support, a single address space, a lack of per-process DLL data, and cooperative multitasking. For the most part, Chicago corrects these issues; that is, it works like Windows NT. It lets 32-bit programs have threads (though 16-bit tasks cannot), and data in DLLs is per-process. There are a few places, however, where corners have been cut. For example, each process in Chicago gets its own address space, but all loaded DLLs are visible to a Chicago process, not just the DLLs that the process has loaded itself. In addition, the memory of the entire 16-bit world is visible to the currently running Win32 process. In other words, 16-bit and 32-bit tasks intermingle in the same address space, unlike Windows NT.

One of the hot-button topics for Chicago is its not-so-smooth multitasking behavior in the presence of 16-bit programs. Chicago really does have preemptive multitasking, but a badly behaved 16-bit program can cause other threads to jam up at the entrance to the USER and GDI DLLs. The problem is that the 16-bit system DLLs are nonreentrant; that is, they don't expect to be switched away from while in the middle of doing something.

Since many of the Win32 API functions thunk down to the system DLLs, some sort of method is necessary to prevent a thread switch at an inopportune moment. Many solutions were discussed. The one that was determined to be the most palatable of numerous bad options is known as the *Win16Mutex*. The Win16Mutex is essentially a mutual-exclusion semaphore that needs to be acquired upon entry to the 16-bit DLLs. The Win16Mutex dictates that only one thread can be executing at one time through the 16-bit system DLLs.

This in itself wouldn't be so bad, but to prevent other problems, the Win16Mutex

is owned whenever a 16-bit application is executed. The unfortunate result is that a 16-bit program that doesn't yield properly by calling GetMessage or PeekMessage can prevent the user interface of 32-bit applications from executing.

The implications of the Win16Mutex are twofold. First, the sooner you move your application to 32 bits, the better. If a system doesn't have any 16-bit programs running, the Win16Mutex can't be a source of trouble. Second, if you're doing time-critical work, you'll probably want to split your application up into multiple threads (for instance, a user-interface thread and one or more worker threads). The Win16Mutex doesn't affect threads that aren't calling down into the system DLLs. These threads will continue to be scheduled preemptively and to execute, even if the entire user interface is tied up with a badly behaved 16-bit program that's not yielding. None of the KERNEL32 functions become blocked by the Win16Mutex, although USER and GDI functions most likely will. With advance planning, you can avoid calls that might become blocked in your time-sensitive threads.

WIN32 FOR DOS? I've been focusing on the Win32 platforms provided by Microsoft. If you have a mix of customers, however, some who want to run DOS and others who want to run Windows NT or Chicago, you have another Win32 option to consider. Phar Lap Software makes a product called TNT DOS Extender SDK, which supports a subset of the Win32 API. This subset doesn't include any graphics or window-system functions. It does cover some of the console API functions, as well as most of the memory- and process-management functions.

An ideal use for TNT is for command line programs that need to be 32 bits and require significant amounts of memory. You can use functions like printf() and fread() without concern for whether your program will run under Chicago, DOS, or Windows NT.

Using the TNT DOS extender can be as simple as changing one line in your linker options. You can continue to use your existing Win32 compiler without any changes. The idea behind the TNT DOS extender is that you use the TNT loader program as the DOS stub program in

your Win32 executable. If you run the executable under Chicago or Windows NT, the operating system ignores the stub program. If you run the program from DOS, the TNT stub program loads the DOS extender and brings in the code that provides the Win32 API subset under DOS.

Interestingly, Microsoft uses the TNT DOS extender in its Win32 tools for Windows NT. Since there were programmers who wanted to develop for Win32s but did not have a Windows NT machine, Microsoft could not make Windows NT a requirement for running the compiler (CL.EXE) and linker (LINK.EXE). By using the TNT DOS Extender, the Microsoft tools run as native Win32 console-mode applications for Windows NT developers and DOS-extended applications for Win32s developers.

A limited version of TNT is provided with Microsoft Visual C++ 32-Bit Edition. The full TNT development kit is available from Phar Lap for \$495. If you want to distribute your TNT-extended application, you'll need to contact Phar Lap (617-661-1510) for a distribution license.

DEVELOPMENT CONSIDERATIONS To develop for any of these Win32 operating systems, you'll need 32-bit development tools. This may sound blindingly obvious. I'm constantly amazed, however, by the number of programmers who intend to target Win32s and think they can use their current 16-bit compilers. They reason, "Win32s runs on top of Windows 3.1, and Windows 3.1 is 16 bit, right?"

All of the major compiler vendors, including Borland, Microsoft, and Symantec, have 32-bit tools available now. If you use other third-party tools or libraries, they may have to be changed or updated. For example, my company publishes a product called Bounds-Checkers for Windows that is designed to test 16-bit applications. Just because Win32s runs on top of Windows 3.1 doesn't mean that Bounds-Checker for Windows can also test Win32s programs. The debug and process-control mechanisms are com-

pletely different under Win16 and Win32, something that often escapes many programmers. Also, there aren't many Win32 versions of popular libraries. You may be faced with the task of writing thunking code to go from your Win32 programs down to the 16-bit DLLs if you simply must continue using them.

Win32s programs are a commonly misunderstood topic. There really isn't such a thing as a Win32s program. Instead, there

There's no such thing as a Win32s program. There are just Win32 programs with varying degrees of compatibility with the Win32 platforms.

are just Win32 programs with varying degrees of compatibility with the Win32 platforms. A program written on a Win32s machine should work just as well on Windows NT. Likewise, a program written on a Windows NT machine has a very good chance of running unmodified on a Win32s machine if you've

avoided Windows NT-specific features like threads or Unicode. The key point is that you should *develop* on the best Win32 platform available to you, even if your program has to run on a less advanced Win32 operating system. You will, of course, need to test on all the platforms you want your program to run on, but there's no reason for you to put up with a flaky, crash-prone operating environment like Win32s while you're developing.

An issue that comes up when you're targeting multiple Win32 platforms is API functions that aren't supported by all the platforms. Let's say, for instance, you have a program that uses threads. Your program checks to see whether it's running on Win32s and doesn't try to start a thread if it is. Even if you don't call CreateThread in this case, your program still has a reference to the CreateThread function in KERNEL32.DLL. Will this program load even under Win32s? The answer is yes.

The Win32s and Chicago system DLLs (KERNEL32.DLL, USER32.DLL, and so on) export all the documented functions that Windows NT provides. If the operating system doesn't claim to provide a specific API function, however, then the exported function is

Take **PC Magazine**

Announcing PC Magazine CD – the new way to access cutting-edge PC information!

Presenting the all-new **PC Magazine CD** – the perfect on-screen companion to your printed issues of **PC Magazine**.

Every quarterly release of **PC Magazine CD** is packed with special enhanced versions of important articles that literally “come to life” with point-and-click interactive screens, instant product demos, exclusive software walkthroughs, “how-it-works” animation, video, and much more!

PC Magazine CD gives you expanded coverage of today's hottest PC topics not available anywhere else – all in a unique cutting-edge interactive format. It's a hands-on tool that lets you access the most important articles, benchmark tests, product specifications and charts from

PC Magazine right from your desktop – quickly and easily.

You'll also run benchmark tests on your own system and see how it compares with top performers. You'll see special on-screen, side-by-side comparisons and actually hear reviewers as they test and critique new products.

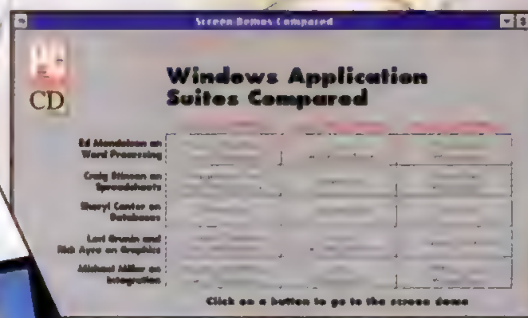
PC Magazine CD comes complete with the full text of every article published in **PC Magazine** during the previous 12 months – plus powerful “super-searching” software to help you find the facts you need instantly!

Act now and you'll enjoy exclusive Charter Subscriber savings. You get four power-packed releases of **PC Magazine CD** for just \$59.95 – and save 25% off the single-copy price. Just call 1-800-787-9677 now to get the next release rushed to you.

PC Magazine CD – it's an incredible, interactive way to get even more out of **PC Magazine**!

Supplies are limited – so start your Charter Subscription to **PC Magazine CD** now!

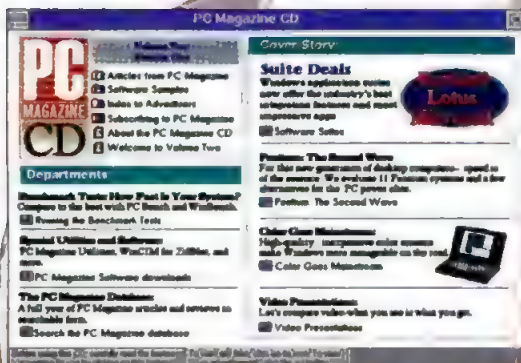
**CHARTER
SUBSCRIPTION
SAVINGS
OFFER!**



CALL TO ORDER NOW!
1-800-787-9677

Mention Priority Code:
4J28

out for a spin



Here's just a sample of the kind of unique information you'll get in every issue of

PC Magazine CD:

- ✓ full text of **every** article published in PC Magazine during the previous 12 months — plus an ultra-fast search engine
- ✓ interactive **walkthroughs** of new software
- ✓ revolutionary on-screen **demos** of new technologies
- ✓ one-click access to performance **benchmark** testing programs
- ✓ bonus **utilities** to boost your performance and productivity
- ✓ exciting **ads and demos** from leading hardware and software firms
- ✓ on-screen **presentations** featuring the PC Magazine editors



Get one-year of PC Magazine CD
(4 quarterly releases)
for just \$59.95.

Use your Visa, MasterCard or
American Express account.



CALL TO SUBSCRIBE

**1-800-
787-9677**

Mention Priority Code:

4J28

Toll free number is available in
the United States and Canada.

Other countries, call

303-447-9330

Or fax your order to

303-443-5080



SYSTEM REQUIREMENTS: PC Magazine CD is designed to run on a 386 or higher PC-compatible with Windows™ 3.1, 4MB RAM and a CD-ROM drive. Windows-compatible soundboard recommended for certain functions.

The single-copy price of PC Magazine CD is \$19.95.

PC Magazine CD is \$71.95 outside the U.S. (includes Canadian GST and shipping charges.)

PC MAGAZINE CD • P.O. Box 59494 • Boulder, CO 80322-9494

just a stub that returns a failure code. Thus, even if you call `CreateThread` from a program running under Win32s, your program won't necessarily blow up into a billion tiny pieces. Instead, the nonimplemented function will gracefully return an error. The debug versions of Win32s and Chicago will even emit a helpful trace output message to the debug port (typically, SoftIce for Windows, WDEB386, or DBWIN), telling you of the nonimplemented API function.

If you decide to target Win32s, be forewarned that you the vendor are responsible for getting the Win32s libraries on your customer's system. Microsoft does supply a setup program that you can distribute to install the Win32s files. Shipping the Win32s files, however, may cause your product to require more disks than it ordinarily would. On top of that, there are versioning issues. At the time of this writing, there have been four versions of Win32s released in a year's time. Code that works on one Win32s version has been known to break on other versions.

THE FUTURE OF WIN32 About the time you're reading this, Microsoft should be preparing to release Windows NT, Version 3.5 (code-named Daytona). The primary benefit of Windows NT 3.5 is that it's slimmer and speedier. Most programmers don't have machines with 20MB or more, which is the lower limit for programming Windows NT without excessive disk thrashing. Windows NT 3.5 should run as well in 16MB as Windows NT 3.1 runs in 20MB. It's much more reasonable to expect developers to have 16MB. Windows NT 3.5 also offers some additional features, such as multiple, separate WOW boxes for each Win16 program. This can prevent one Win16 program from adversely affecting other Win16 programs. The Windows NT 3.5 user interface isn't very different from Windows NT 3.1. In this respect, Chicago will be ahead of Windows NT in terms of user-interface design.

Beyond Windows NT 3.5 is the next major revision of Windows NT, code-named Cairo. Cairo will use the Win32 API and is supposed to be extremely ob-

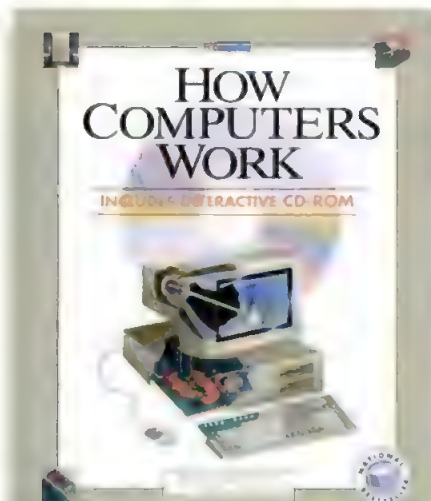
ject oriented, even down to its file system. Cairo should also sport Microsoft's post-Chicago ideas on user-interface design. Since Cairo will be a revision of the Windows NT code base, its platform independence will be at the cost of increased code size and slower performance.

It's not clear at this point if Chicago is the end of Microsoft's 32-bit Intel-specific operating-system line. If hardware prices and capabilities are conducive to running Cairo on average desktop systems, Microsoft may discontinue parallel developments of two Win32 operating systems. On the other hand, if most people's hardware won't run the portable Cairo code base, Microsoft will certainly continue to develop an Intel-specific Win32 platform to keep market share. □

MATT PIETREK IS AUTHOR OF *WINDOWS INTERNALS* AND A CONTRIBUTING EDITOR OF *MICROSOFT SYSTEMS JOURNAL*. HE DEVELOPS DEBUGGING TOOLS FOR NEW HAMPSHIRE-BASED NU-MEGA TECHNOLOGIES. HE CAN BE REACHED ON COMPUSERVE AT 71774,362.

Click Click,

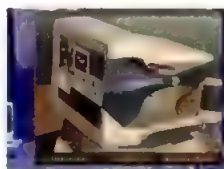
**PC/Computing
How Computers Work
CD-ROM/Book extravaganza
from Ziff-Davis Press.**



ISBN: 1-56276-250-8 Price: \$39.95

Click your way through an electrifying multimedia voyage to the heart of the computer with *How Multimedia Computers Work*—a unique CD-ROM packaged with the classic best-selling book *PC/Computing How Computers Work*.

In *How Multimedia Computers Work*, fun, fast-paced, fascinating tours of your computer's incredible innards combine state-of-the-art 3D animation with lively dialog and music for a

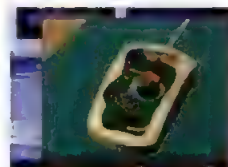


richly interactive sensory feast. Also included are provocative video interviews with well-known computer industry figures—plus tons of computing tips from the top authors at Ziff-Davis Press. Teamed up with a book that has already shown legions of computer users what makes their machine tick, *How Multimedia Computers Work* is a real whiz-bang experience that's sure to make you see your computer in a whole new light. Ask your favorite bookseller for *PC/Computing How Computers Work* with *How Multimedia Computers Work* on interactive CD-ROM.

W H I Z

BANG

Ziff-Davis Press books are available at all fine bookstores, or call 1-800-688-0448, ext. 226.



© 1994 Ziff Davis Press

Utilities

BY CHARLES C. EDWARDS

Customize Your Group Icons

Although Microsoft Windows 3.1 is a much friendlier environment than DOS, its user interface still leaves much room for improvement. Ever since the introduction of the Program Manager with Windows 3.0, I have been annoyed by the group icons that are displayed when program groups are minimized. Actually, rather than *icons*, perhaps I should say *icon*, since each group displays the same exact icon when minimized. Not only is this aspect of Windows aesthetically unappealing, but because of it, locating groups is difficult if you have more than three or four loaded. Windows is supposed to be a graphical user interface. Why should we have to depend on the text description underneath the icon to differentiate the groups? When you're searching for a particular group, it would be much easier if the group icons were customized to reflect the contents just as program icons are.

MyGroups solves this problem. MyGroups lets you change group icons in much the same manner as you would change icons for individual programs. Figure 1 shows the Program Manager with MyGroups installed. Despite its appearance, this is not a maximized program group you are looking at. Rather, this is the Program Manager window with most of the groups minimized. For comparison purposes, an open program group is shown in the upper-left-hand corner. As you can see, it's much easier to identify individual groups this way than with the identical group icons that you get by default. Now that I've been using MyGroups for a while, I find it a bit disconcerting to visit someone else's PC and see the ordi-

nary group icons. After you've used MyGroups, I think you'll feel the same way.

You can download all of the files needed to run or recompile MyGroups from our on-line service, PC MagNet, or you can obtain them by mail. The file GRPPGM.ZIP contains the program itself, GRPSRC.ZIP contains the source code, and GRPDDL.ZIP contains DLLs needed only by those using Windows 3.0. The file MYGRPS.ZIP contains both the program and its source code, but not the DLLs; those must be downloaded separately. See the sidebar "Guide to Our Utilities & How to Get Them" for more information. The source code can be recompiled with Borland Pascal, Version 7.0, or Turbo Pascal for Windows, Version 1.5.

USING MYGROUPS To use MyGroups, simply copy the file MYGROUPS.EXE to your hard disk and then run it from the Program Manager. Windows 3.0 users

should copy the previously mentioned DLLs into their Windows SYSTEM directories. You may even want to add MyGroups to the Run= line in WIN.INI or (for Windows 3.1 users) to your Startup group.

After MyGroups starts you will see a brief copyright screen; otherwise, you won't notice anything different at first. There won't even be a new program icon at the bottom of the screen, and all the Program Manager group icons will look the same as when you last ran Windows. MyGroups is designed to run as a seamless extension to Windows and is accessed by clicking on the system menu of a group icon. When you do this, you will see two new menu items: Change Icon and Unload MyGroups.

Selecting Change Icon brings up the dialog box shown in Figure 2. This dialog box is very similar to the one displayed by Windows 3.1 when you change the icon of an individual program. This makes it instantly familiar to most users.

Initially, you will be presented with a list box containing the 45 icons supplied by the Program Manager. You can select an icon either by clicking on it and then clicking on the OK button or by double-clicking the icon. If you want to use an icon from a different file, you can use the Browse button to select the new file or enter the new filename and click OK. This loads the icons from the new file into the list box. The Default button changes the icon back to the Program Manager default, and the Cancel button exits the dialog box without changing the icon.

Suppose you have a group called Word for Windows and you want to use the WinWord icon as the group icon. Normally, you would have to browse the WINWORD directory (or wherever WinWord is installed), find the file WINWORD.EXE, and display its icons. But the WinWord icon already exists inside the group. Why shouldn't you be able to just display the program icons and select the WinWord icon from that list. The Programs button provides a shortcut that does exactly that. When you click this button, all of the program icons in the current group are displayed in the list box. The Programs button then changes to a Prior File button. Clicking this button again reloads the icons that were displayed prior

Top 10 Utilities	
Rank	Utility
1	WINCMD - Command file interpreter
2	WCLIB - DLL for WINCMD
3	WTIME - Keeps PC clock accurate
4	FINDIR - IRQ line analysis
5	MONITOR - Monitors system resources
6	BAT2EX - Compiles batch files
7	INCTRL - Controls Windows installation
8	BUGS - Windows 3.1 screen saver
9	CONFIX - Issues commands at boot time
10	THINDI - Windows file analysis
This list is based on the total number of downloads each utility has had on PC MagNet over the past month. To download these files, type GO ZNT:TIPS. For more information, see the sidebar "Guide to Our Utilities & How to Get Them."	

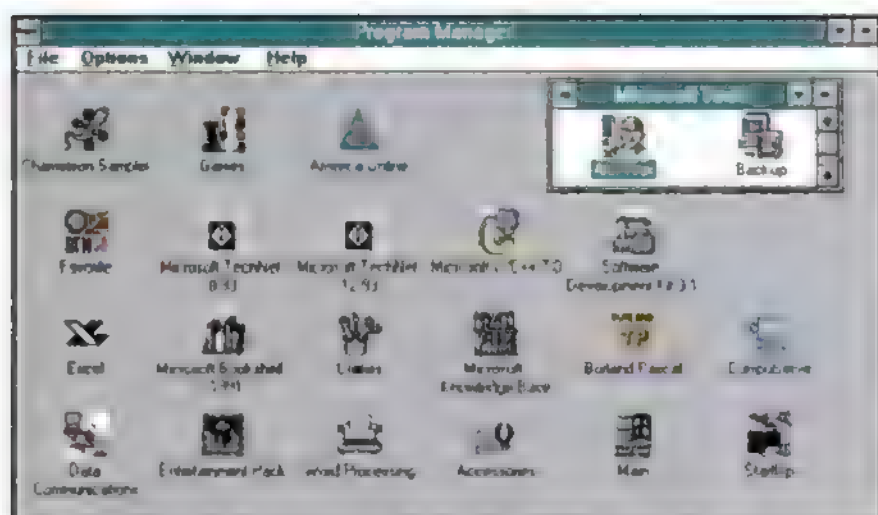


Figure 1: When MyGroups is loaded, the Program Manager can display unique, customizable icons for each group.

to pressing Programs.

If you attempt to open a file that contains no icons, you will receive a message notifying you of that fact, and MyGroups will instead present you with a list of the icons available in the Program Manager. If you try to select an icon from a removable device, such as a floppy disk, CD-ROM drive, or a network drive, you will be asked to confirm the action. If the file containing the icon is not available the next time you start MyGroups, a message will notify you that the file cannot be found, and the default group icon will be used instead.

MyGroups maintains an .INI file called MYGROUPS.INI, which stores the location of the icon for each program group. This file is created automatically the first time you run MyGroups. If you delete or rename a group, MyGroups detects this and makes the appropriate changes to the .INI file. Such changes are not detected, however, if they are made while MyGroups is not loaded. For instance, if you rename a group from ABC to XYZ and then start MyGroups, group XYZ will not be found in the .INI file. Group XYZ will therefore display the default icon. On the other hand, group ABC is still in the .INI file, but that group no longer exists. MyGroups will display a message asking if you want to remove the ABC entry from the .INI file. The same message will be displayed if you delete a group while MyGroups is not running.

If you frequently make changes to your groups while MyGroups is not running, you may want to disable the start-up warnings. If you don't want MyGroups to notify you that the file containing a group icon cannot be found, place the statement WARNICON=0 in the [Warnings] section

of MYGROUPS.INI. If you don't want MyGroups to notify you about any groups that were deleted or renamed while MyGroups was not running, put WARNGROUP=0 in the same section.

If for any reason you want to unload MyGroups and restore all your groups to the default icon, just select Unload MyGroups from the system menu of any group. After confirming the action, all the group icons

are restored to the default, and MyGroups is removed from memory.

If you want to delete MyGroups permanently, you must remove the icon from your Startup group or MYGROUPS.EXE from the Run= line in your WIN.INI file. Then unload MyGroups from memory if it is currently running and delete the file MYGROUPS.EXE from its subdirectory. Finally, delete MYGROUPS.INI from your Windows directory.

INSIDE MYGROUPS To understand how MyGroups works, you must first understand why the Program Manager groups all have the same icon by default. By now, most people know that there is nothing particularly special about the Program Manager. It is just a Windows application much like any other application. In fact, many third-party products, such as The Norton Desktop, have been written to replace the Program Manager.

Like many other applications, the Program Manager uses the Multiple Document Interface (MDI) mechanism, which allows multiple child windows to exist within a main window. These MDI children behave much like regular Windows applications: Each has its own system menu, and each is capable of being minimized or maximized. But unlike an application, an MDI child window does not minimize to the desktop or maximize to fill the screen. When minimized, the MDI child icon appears within the parent window rather than on the desktop. When maximized, the child fills the parent window, and its system menu appears to the left of the application's main menu.

Another example of an MDI application that ships with Windows is Sysedit. (Although an icon is not automatically created for Sysedit when you install Windows, you will find it in your Windows system directory.) This program opens four MDI child windows containing your AUTOEXEC.BAT, CONFIG.SYS, WIN.INI, and SYSTEM.INI files. If you minimize these windows, you will see that they all display the same icon within the parent window.

The Program Manager works exactly the same way. Each program group is actually an MDI child. But rather than displaying text, these child windows display icons associated with the programs on your computer. As in Sysedit, when these windows are minimized, they all display the same icon. The Program Manager's use of MDI explains why it does not support nested program groups—that is, you can't have a program group window that contains another program group.

Typically, when an MDI application registers its child class, it specifies an icon for the child-window class, called a *class icon*. This method of specifying child icons is nice and easy; it doesn't require any additional code, since Windows handles it automatically. MyGroups adds code that makes the Program Manager group icons customizable.

SUBCLASSING AND SUPERCLASSING MyGroups performs this feat by *subclassing* PMGroup—the Program Manager child window class—and then *subclassing* each of the existing group windows. Superclassing and subclassing are powerful Windows programming techniques that allow a program to change the behavior of any preexisting window or class.

When a program registers a new class with Windows, that program provides the address of the *window function*, which handles all messages generated for that

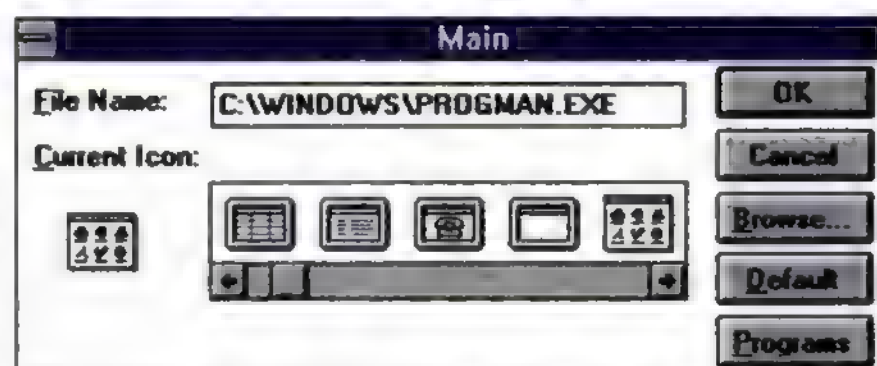


Figure 2: Selecting Change Icon from the system menu of a program group brings up this dialog box, which allows you to select a custom icon for the group.

DECpc™ LPv+ 433sx

- Intel 486™ SX/33MHz
- 4MB RAM
- 170MB IDE hard drive
- 14" SVGA 1024(i) color monitor
- S3™ 805 GUI accelerator
- 3 Year Warranty

\$1,398 \$49/mo.
lease

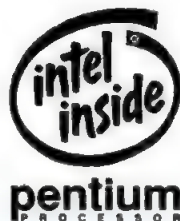


Lean.

DECpc LPx 560

- Pentium™ 60MHz processor
- 256KB cache
- 8MB RAM
- 340MB IDE hard drive
- 14" SVGA 1024(i) color monitor
- PCI local bus
- 6 slots (3 ISA, 2 PCI, 1 interleaved)
- S3 928 video adapter
- 3 Year Warranty

\$2,798 \$98/mo.
lease



DECpc LPx 566

- Pentium™ 66MHz processor
- \$3,098 \$108/mo.
lease

Do more. Work
faster. Spend less.

Run lean.
Go green. Get
mean.

Not next year.
Not next quarter.
Now.
Not to worry. These
two PCs can make
this daunting
challenge a tad
easier for you.

First, there's the lean

DECpc LPv+ 433sx.

On the outside, it's got
a slim enclosure that
frees up space on your
desk (remember
your desk?).

On the inside,
it's a powerhouse in
its own right.

Compared with
earlier models, it
now offers a
beefed-up hard
drive, faster serial
port and 2.88 floppy support.

on their electric bills?

Next, our DECpc LPx
560. Expect to pay extra for
Pentium™ technology, a PCI
bus *and* a 340MB hard drive?
Our advice: save your money.

With Digital you get all
this at the price of others'
stripped-down models.

Made-by-Digital quality.
Made-by-who prices. Does
lower price translate to lower
quality? Not when our name
goes on the box, thank you.

Green.

In fact, both PCs are
engineered by the same folks
who build our high-end PCs:
Us. And both are covered by
our three-year warranty.*

Call now. So you can
start running lean, going
green and getting mean
in a hurry.

Not next year. Now.

And Mean.

Meaner still?
Call about our new
Celebris series.

Yet it uses less than 30
watts in sleep mode. And
who wouldn't want to save

digital™
PC
Beyond the box.

1 800 448-1540

To order, or for the name of the Digital
reseller near you, call 8:30 a.m. to 8:00 p.m.
ET, Mon.-Fri. Please reference JEC
when you call.

© DIGITAL EQUIPMENT CORPORATION, 1994. The DIGITAL logo and DECpc are trademarks of the Digital Equipment Corporation. Beyond the Box is a service mark of the Digital Equipment Corporation. i486, Intel486 and the Intel Inside Logo are trademarks of Intel Corporation. The EPA ENERGY STAR emblem does not represent EPA endorsement of any product or service. S3 is a trademark of S3 Corporation. Windows is a trademark of Microsoft Corporation. Digital believes that the information in this advertisement is accurate as of its publication date; such information is subject to change without notice. Digital is not responsible for any errors. Actual monitor may differ from that shown. Not all products available worldwide. *Three-year limited hardware warranty. Certain restrictions and exclusions apply.


```
Function PMProc(Window:HWND; Msg:WPARAM; lParam:LPARAM):LongInt;
Export;
Var MDIActive:LongInt;

Begin
Case Msg of
  WM_Command:
    Begin
      If ((WParam and $FFF0 = CM_ChangeIcon) or
          (WParam and $FFF0 = CM_UnloadProg)) and
          (LowWord(lParam) = 0) then
        Begin
          MDIActive:=SendMessage(MDIClient,WM_MDIGetActive,0,0);

          If HiWord(MDIActive) = 1 then (Maximized)
            PostMessage(LowWord(MDIActive),WM_SysCommand,WParam,0);
          End;
        End;
      WM_InitMenu:
        Begin
          MDIActive:=SendMessage(MDIClient,WM_MDIGetActive,0,0);
          If HiWord(MDIActive) = 1 then (Maximized)
            SendMessage(LowWord(MDIActive),WM_InitMenu,WParam,lParam);
          End;
        End;
    End;
  PMProc:=CallWindowProc(oldPMProc,Window,Msg,WParam,lParam);
End;
```

Figure 3: The function PMProc forwards system messages to the MDI child when the current group is maximized.

type of window. Windows maintains a master copy of this address in a special class structure. Each time a new window of that class is created, it gets its own private copy of the window-function address. When a class is superclassed, the master-copy address of the window function is replaced with the address of a different window function. This allows us to examine all messages destined for the new windows of that class and implement a different behavior. After processing the message destined for it, the new window function must pass the messages along to the original window function.

Since only the master copy is changed, superclassing affects only windows created after MyGroups is loaded. Superclassing has no impact on existing windows, since they are still using their private copy of the old window-function address. That's where subclassing comes in. Subclassing replaces the window function of existing windows with the new function so that they also exhibit the new behavior—in this case customized icons.

MyGroups finds the Program Manager by using the Windows API (application programming interface) function EnumWindows(). The Program Manager is identified by the window class of its main window, called PROGMAN. We then

find the children of this window (that is, the program groups) by using the API function EnumChildWindows(). When we find the program-group MDI child, PMGroup, we superclass it by saving the master address of the old window function and then replacing it with the address of MyGroups' own GroupProc() function. MyGroups also saves the handle of the default group icon and replaces the handle with 0.

A 0 in a window class's icon field indicates that that class has an owner-drawn icon. Each time the icon needs to be drawn, Windows sends the window function a WM_PAINT message requesting that the function draw a custom icon. The GroupProc() function handles those WM_PAINT messages and a few related messages and passes along everything else to the previous window procedure. After this is done, we subclass the existing program groups by changing their private copies of the window-function address to that of GroupProc()'s.

Every window, including MDI child windows, has an associated property list that is maintained by Windows. The property list lets you attach any 16-bit value to a window. Each property is identified by a unique string identifier. We will attach two new properties to each Program

Manager child window. There is no predefined limit to the number of properties that can be associated with a window. However, property lists exist in the USER heap, which is part of those infamous system resources—a limited quantity. MyGroups uses 15 bytes of the user heap for the properties of each program group. So even if you have 100 program groups, MyGroups would utilize only 1.5K of the 64K available in this area.

When a new icon is loaded for a program group, we need some place to store it. MyGroups uses the Windows property list feature for this purpose. An icon is attached to a window with the following API function call:

```
SetProp(window, 'Icons', icon);
```

where *window* is the window handle, 'Icons' is a quoted string that uniquely identifies the property, and *icon* is an icon handle. The handle can be retrieved using

```
Icon := GetProp(Window, 'Icons');
```

Making use of the Windows property list eliminates the need to maintain a separate list of icon handles. It also saves us from writing code to search the list. Windows will do all of that work for us.

```
Procedure LoadIcons(FName:PChar);
Const Dest:Array [0..255] of Char = '';

Var I.VisibleIcons:Word;
    Icon:hIcon;
    Cursor:hCursor;

Begin
  If IconCol <> Nil then
    Begin
      Dispose(IconCol,Done);
      IconCol:=Nil;
      SetWindowText(GetDlgItem(Window,id_Programs),'&Programs');
    End;
  Cursor:=SetCursor(LoadCursor(0,idc_Wait));
  FileExpand(Dest,FName);
  SendDlgItemMessage(Window,id_IconBar,lb_ResetContent,0,0);
  Icon:=ExtractIcon(hInstance, Dest, 0);
  If Icon < 2 then
    Begin
```

```
    MessageBox(Window,'There are no icons in this file.'^M+
      'You may choose from the icons in the Program Manager.',
      FName,mb_IconExclamation or mb_OK);
    FileExpand(Dest,ProgMan);
    Icon:=ExtractIcon(hInstance, Dest, 0);
  End;
  StrCopy(OldFile, Dest);
  I:=0;
  Repeat
    SendDlgItemMessage(Window,id_IconBar,lb_AddString,0,Word(Icon));
    Inc(I);
    Icon:=ExtractIcon(hInstance, Dest, I);
  Until Icon < 2;
  If (Lo(WinVer) = 3) and (Hi(WinVer) < 10) then
    Adjust_Win30;
  SendDlgItemMessage(Window,id_IconBar,lb_SetCurSel,0,0);
  SetWindowText(GetDlgItem(Window,id_File),Dest);
  SetCursor(Cursor);
End;
```

Figure 4: The procedure LoadIcons extracts all of the icons from an .EXE, .DLL, or .ICO file and inserts them into the list box in the Change Icon dialog box.




```

wm_InitDialog:
.
.
SendDlgItemMessage(Window, id_IconBar, lb_SetColumnWidth,
(GetSystemMetrics(sm_cxIcon)+10), 0);
.
.
wm_MeasureItem:
With PMeasureItemStruct(lParam)^ do
If CtlID = id_IconBar then
itemHeight:=GetSystemMetrics(sm_cyIcon)+4;
wm_DrawItem:
With PDrawItemStruct(lParam)^ do
If CtlID = id_IconBar then
If (ItemAction = oda_DrawEntire) or
(ItemAction = oda_Select) then
Begin
J:=SetMapMode(hDC, mm_Text);

```

```

If (ItemState and oda_Selected) = oda_Selected then
Brush:=SelectObject(hDC, CreateSolidBrush(
GetSysColor(COLOR_HIGHLIGHT)));
else
Brush:=SelectObject(hDC, CreateSolidBrush(
GetSysColor(COLOR_WINDOW)));
PatBlt(hDC, rcItem.Left, rcItem.Top,
rcItem.Right-rcItem.Left,
rcItem.Bottom-rcItem.Top,
PatCopy);
DrawIcon(hDC, rcItem.Left+5, rcItem.Top+2,
LoWord(itemData));
DeleteObject(SelectObject(hDC, Brush));
SetMapMode(hDC, J);
End;
wm_DeleteItem:
With PDeleteItemStruct(lParam)^ do
If CtlID = id_IconBar then
DestroyIcon(LoWord(itemData));

```



Figure 5: This code fragment from GroupProc illustrates the steps needed to draw the icons in Change Icon's list box.

We also add a window property called Menu, and set the initial value to 0. This serves as a flag indicating that the two new menu items, Change Icon and Unload MyGroups, have not yet been added to the system menu.

Finally, we look in MYGROUPS.INI to see if a new icon has been specified for this window. If it has, we attempt to load the new icon and use it. If it cannot be loaded, the default Program Manager group icon is to be used.

THE MDI WINDOW FUNCTION After the superclassing and subclassing is completed, MyGroups no longer executes any code on its own. It only responds to window messages intercepted from the Program Manager by the new window function, GroupProc(). GroupProc() is a standard window-event handler of the type that you have seen many times before if you've done Windows programming without an application framework. It consists of a large case statement that branches to the appropriate point in the code, based on the type of message received. GroupProc() responds to the following messages:

WM_PAINT. This is the heart of MyGroups. If the group window is minimized, we need to draw the new icon. The icon is retrieved with the GetProp() function and drawn in the Program Manager client area with the DrawIcon() API function.

WM_ERASEBKGD. This message tells us to erase the background in preparation for drawing the icon. This is a fairly simple procedure if the background is a solid color but gets tricky if the background has been configured as a bit pattern via the Control Panel. I won't discuss all of the details here, but you can refer to

Charles Petzold's classic book *Programming Windows* for an excellent description of the process.

WM_QUERYDRAGICON. This message is sent when the user drags a group icon across the Program Manager workspace. MyGroups returns a handle to the proper icon. If this message were ignored, you would see only a white square when dragging the icon.

WM_SYSCOMMAND. When a command is selected from the MDI child system menu, we need to see if the Change Icon or the Unload MyGroups commands are being added. If so, we need to respond to this message.

WM_CREATE. When a new program group is created, MyGroups sets the two property items for the group. Initially, the Icon property is set to the default Program Manager group icon, and the Menu property is set to 0, indicating that the new menu items have not yet been added to the system menu.

WM_INITMENU. This message is sent by Windows before displaying the system menu. If the Menu property indicates that the two new menu items have not yet been added, they are added, and the property is changed to 1 to mark that this is done.

WM_DESTROY. When a program group is deleted, MyGroups deletes the property list for the window, discards the custom icon, restores the default icon, and deletes any entry in the MYGROUPS.INI.

WM_SETTEXT. MyGroups uses the group description to keep track of which icon goes with which program group. If the user changes the description, then we need to update MYGROUPS.INI to reflect the new value.

All other Windows messages are simply passed to the original window function. In fact, most of the messages that MyGroups handles are also passed to the original function. In most cases, we want to add to the default behavior, not completely replace it.

THE PROGRAM WINDOW FUNCTION During the testing of MyGroups, an interesting idiosyncrasy turned up in the way that Windows handles MDI children. Normally, when a menu item is selected from the child system menu, Windows dispatches a WM_SYSCOMMAND message to the window. But if the MDI child is maximized, this message is not sent. Instead, a WM_COMMAND message is sent to the MDI parent window (also

```

TMeasureItemStruct = record
CtlType: Word;
CtlID: Word;
itemID: Word;
itemWidth: Word;
itemHeight: Word;
itemData: Longint;
end;

```

```

TDrawItemStruct = record
CtlType: Word;
CtlID: Word;
itemID: Word;
itemAction: Word;
itemState: Word;
hwndItem: HWND;
hDC: HDC;
rcItem: TRect;
itemData: Longint;
end;

```

```

TDeleteItemStruct = record
CtlType: Word;
CtlID: Word;
itemID: Word;
hwndItem: HWND;
itemData: Longint;
end;

```



Figure 6: These structures are passed to the dialog function when it's processing owner-drawn controls.

**Finally,
computer TV
that doesn't
insult your
intelligence.**



TECHNOLOGY INFORMATION

N E T W O R K

**Two hours of television
about computer products.
Just for people like you.**

Your hunt for information about the latest computer products and trends is changing forever.

You can now turn on the Technology Information Network, four original, compelling weekly half hour TV shows that enable you to experience new products, see how they work, learn about their technical specs and features, and—best of all—buy the advertised products directly from us or via your local participating retailer.

**Four programs, each with
a unique focus**

PC Update—news you can use about the latest products, trends, applications. Draws upon the industry's most knowledgeable experts including Ziff-Davis' own editors, for opinion, evaluations, advice.

Inside Technology—3 to 7 minute product and solutions-oriented segments which explain the technology and guide viewers in making product selections.

The Personal Computing Show—real-life examples of personal computer use for education, entertainment, enrichment and home office applications.

The Computer Outlet—offering a dozen or more products for sale at great prices. Purchase from your home via an 800# or through participating local retailers.

**Produced by two of the greatest
names in the computer industry**

 **Ziff-Davis
Publishing**

the leading provider of quality computer product information through magazines, newspapers, newsletters, books, CD-ROM products, on-line services, trade shows and conferences.



**MISSINGLINK[®]
COMMUNICATIONS**

an affiliate of Intelligent Electronics, Inc., the nation's largest supplier of computer products and services.

Every week on CNBC, Jones Computer Network, America's Talking and many other stations.


```
While GetModuleUsage(MyModule) > 1 do
  FreeLibrary(MyModule);
(We can't call FreeLibrary for the last instance of the
module since the code won't be here for us to return
to! Instead we fix up the stack to return to the code
that called us and JUMP to FreeLibrary.)
Asm
MOV  DX, [MyModule]
POP  DI          (Restore DI and SI)
POP  SI
LEA  SP, [BP-2]  (Remove locals from stack)
POP  DS          (Restore DS and BP)
POP  BP
DEC  BP
POP  AX          (Save return address)
POP  BX
ADD  SP, $0A     (Remove parameters from stack)
PUSH DX          (Push module ID)
PUSH BX          (Push return address)
PUSH AX
JMP  FreeLibrary (Unload MyGroups)
End;              (We never return from this)
```



Figure 7: This code section from GroupProc modifies the stack and transfers control to FreeLibrary() to unload MyGroups from memory.

called the *frame window*). This means that when the MDI window is maximized, MyGroups doesn't respond to either of the new menu items. The same problem exists with the WM_INITMENU message. If the program group is maximized, it is dispatched to the parent rather than the child.

Fortunately, this is easy to fix. Each MDI application contains a hidden window, called the *client window*. This window is a child of the frame window and is responsible for managing the MDI child windows (in this case, the program groups). MyGroups can interrogate the client window to find out whether the current child is maximized and, if so, take appropriate action. The code that does this is shown in Figure 3.

In addition to subclassing the child windows, MyGroups also subclasses the frame window. When the frame window receives a WM_COMMAND message, we check to see if the user selected the Change Icon or Unload MyGroups menu item. If so, we issue a WM_MDIGETACTIVE message to the client window. This returns a long result that contains the window handle of the current MDI child in the low word and a flag indicating whether the window is maximized in the high word. If the high word contains a 1, meaning that the child is maximized, then we use PostMessage() to send the expected WM_SYSCOMMAND message to the child.

WM_INITMENU messages are han-

dling the same way except that we use SendMessage() rather than PostMessage() to dispatch the message to the MDI child. PostMessage() is an asynchronous process, while SendMessage() is synchronous. In other words, messages sent via SendMessage() are executed immediately. We want immediate execution to ensure that the menu is modified before re-

turning from WM_INITMENU message processing. The WM_SYSCOMMAND message, on the other hand, may trigger the display of a dialog box, so to conserve stack space, we defer that action until the next message is extracted from the queue.

THE CHANGE ICONS DIALOG BOX

When you change the group icon, MyGroups displays a dialog box similar to the one Windows 3.1 uses to change program icons. This dialog box contains a list box with all of the icons from a given file. While Windows provides built-in support for text-based list boxes, there is no automatic way to display a graphical image, such as an icon, in a list box. The only way to do this is to draw the image yourself using an owner-drawn list box.

There is much mystery surrounding owner-drawn controls. Many programmers think they are too complicated and therefore never try to use them. While there are certainly easier aspects of Windows programming, owner-drawn controls aren't really all that hard. In the case of MyGroups, the dialog function needs to respond only to three additional messages.

Before we look at actually drawing the icons, let's consider how we can associate the icons with list-box elements. When you add an item to a plain text-based list box, one of the parameters is a pointer to the string to be added. With an owner-drawn list box, this parameter is replaced with any 32-bit value that is meaningful to the program. In the case of MyGroups, we

use only 16 of these bits to hold the handle for an icon. This code is located in the procedure LoadIcons(), which is shown in Figure 4.

LoadIcons() accepts a filename as a parameter. First, it checks to see whether the dialog box is currently displaying the group's program icons. If so, it disposes of them and changes the Prior File button back to a Programs button. Then after changing the cursor to an hour glass and resetting the contents of the list box, it tries to extract the first icon from the file. If this fails, it notifies the user and uses the icons in PROGMAN.EXE instead. It then goes into a loop, extracting each icon in turn and sending a WM_ADDSTRING message to the list box.

The last parameter of the SendMessage() call is a handle to an icon. This handle, in turn, is passed to the dialog function Icon_Dialog() at various points during the life of the dialog box.

Figure 5 shows a code fragment from Icon_Dialog() that demonstrates how the icons in the list box are drawn. During the processing of the WM_INITDIALOG message, the only additional step needed is to notify Windows of the width of each icon. We send a LB_SETCOLUMNWIDTH message to the list box to do this. Note that we add 10 to the actual width of the icon so that the icons don't bump up against each other.

The three additional messages mentioned earlier are WM_DELETEITEM, WM_DRAWITEM, and WM_MEASUREITEM. There is a fourth message, WM_COMPAREITEM, used by sorted owner-drawn list boxes, but since our list box is unsorted, MyGroups doesn't respond to it. Passed along with each of these messages, in the lParam parameter of the dialog function, is a pointer to a structure. The WM_MEASUREITEM message receives a pointer to a TMEASUREITEMSTRUCT, WM_DRAWITEM gets a pointer to a TDRAWITEMSTRUCT, and WM_DELETEITEM has a pointer to a TDELETEITEMSTRUCT. The layouts of these structures are shown in Figure 6.

The WM_MEASUREITEM message is sent when the list box is first being created. We specified the width of an icon while processing WM_INITDIALOG, and now we must provide the height. The

code for this message simply sets the `ITEMHEIGHT` field in the `TMEASUREITEMSTRUCT` to the icon height plus 4. The extra 4 pixels provide some breathing space around the image.

The most important message is `WM_DRAWITEM`. Windows sends this message whenever an icon needs to be displayed in the list box. This code first sets the mapping mode to `MM_TEXT`, as required when drawing icons. If we are drawing the currently selected icon, we paint the background of the list box with the default highlight color. If the icon is not selected, the default window background color is used. Both of these colors can be changed from the Control Panel, so it is important not to hard-code the colors. The `DrawIcon()` API function is then used to display the icon in the list box. Note that we use the low word of the `TDRAWITEMSTRUCT.ITEMDATA` field for the icon handle. This is the same value that was passed to the list box in the function `LoadIcons()`.

The last message, `WM_DELETEITEM`, is sent either when the list box is destroyed or when an icon is removed from the list box. In response to this message, we call `DestroyIcon()` to free the memory occupied by the icon, passing the `TDELETEITEMSTRUCT.ITEMDATA` field.

UNLOADING MYGROUPS Terminating `MyGroups` is not a trivial task. Although the program is called `MYGROUPS.EXE`, it is really a dynamic link library (DLL) that attaches itself to the Program Manager. To remove it, we have to undo the subclassing and superclassing performed during initialization and then call `FreeLibrary()` to unload the DLL. It is the second part of this job that is the most interesting.

A DLL is normally loaded by a Windows program either statically by using an import library or dynamically by calling `LoadLibrary()`. In the latter case, each successive call to `LoadLibrary()` does not load another copy of the DLL but rather increments the usage count of the current copy. The API function `FreeLibrary()` reverses this process, decrementing the usage count. When the count reaches 0, the library is unloaded from memory.

The problem here is that nothing actually loaded `MyGroups`. It was run just as if

it were another program. This means that for `MyGroups` to be unloaded, it must call `FreeLibrary()` itself. So what's the problem? The problem is that the `FreeLibrary()` function expects to return to the caller after doing its job, but in this case its job is to unload the caller. So when `FreeLibrary()` returns, it will be returning to code that no longer exists. This is a sure-fire route to a General Protection Fault.

The solution I arrived at was to trick `FreeLibrary()`. Before invoking `FreeLibrary()`, `MyGroups` modifies the stack to make `FreeLibrary()` look as if it were called not from `MyGroups` but from the internal Windows function that called `MyGroups`. This way, instead of returning to `MyGroups`, `FreeLibrary()` returns to that function. This code is located in the function `GroupProc()` and requires the use of Borland Pascal's built-in assembler. The code is shown in Figure 7.

To implement this strategy, we first call `FreeLibrary()` normally until the usage count is 1. This is necessary because the user may have accidentally invoked `MyGroups` multiple times, thus increasing the usage count. During program initialization, `MyGroups` saved its module ID in a variable called `MyModule`. We now load that value into the `DX` register for safekeeping. This has to be done early in the process since we will be changing the `DS` register, and `MyGroups` global data will no longer be easily accessible.

Next, we pop the `DI` and `SI` registers from the stack, where the function entry code saved them. The `LEA` instruction then removes all of the local variables from the stack in one fell swoop. After the `DS` and `BP` registers are restored, the next two items on the stack are the selector and the offset of the function that called `GroupProc()`. These words are saved in the `AX` and `BX` registers. Finally, we remove the parameters that were passed to `GroupProc()`. `GroupProc()` accepts four parameters, consisting of three word variables and one longint. This comes to a total of 10 bytes, so adding 10 to the `SP` register eliminates them.

Now we're ready to simulate a call to `FreeLibrary()`. First, we push the `DX` register, which contains the module ID, onto the stack. This is the one parameter accepted by `FreeLibrary()`. Normally, we would now do a `CALL` to `FreeLibrary()`,

but instead we push the return address that we saved earlier (the one to which `FreeLibrary()` will return) and jump to the `FreeLibrary()` function. `FreeLibrary()` then decrements the usage count and, if it is 0, unloads `MyGroups`. Control will then return to the code that called `MyGroups` in the first place, and all is well.

DATA SEGMENTS AND DLLS Borland Pascal automatically marks the data segment of any program or DLL as `FIXED`. This means that it always occupies the same address in linear memory. For a program running in Standard or Enhanced mode, this is not an issue: Windows is still free to move the data around in physical memory as it sees fit. In Enhanced mode, program data can even be swapped to disk. As long as Windows is running in one of the protected modes, the fixed attribute is of no consequence to a program, and Windows actually turns that attribute off when the code or data segment is initially allocated. `FIXED` segments are a legacy of Real-mode Windows, where such segments cannot be moved at all.

Fixed segments do exact a price in a DLL, however. Even in protected-mode Windows, a fixed segment in a DLL will never be relocated in linear memory. This is potentially dangerous since Windows attempts to load fixed segments as low in linear memory as possible. It is not widely known, but the first megabyte of linear memory is a critical resource in Windows. Many people have seen out-of-memory errors even while Windows is still showing plenty of extended memory and GDI and USER resources. In many cases, lack of memory in the first megabyte is the cause.

Even worse, Windows Enhanced mode may page lock a fixed DLL segment. A page-locked segment cannot be written to the swap file and always occupies physical memory. This behavior was implemented for those few instances when a DLL must guarantee that its code and data always be present, such as in an interrupt handler. But `MyGroups` and the vast majority of other DLLs do not require such drastic measures. Most DLLs run just fine with unlocked, movable data segments.

Two lines of code in the start-up section of `MyGroups` make sure that the data segment does not interfere with Windows memory management. These lines are


```
GlobalPageUnlock(DSeg);  
GlobalRealloc(LOWORD(GlobalHandle  
(DSeg)),0,GMEM_MODIFY or  
GMEM_MOVEABLE);
```

The first line unlocks the memory used by the data segment so that Enhanced-mode Windows can swap it to disk. The second line reallocates the memory as MOVEABLE rather than FIXED, so the Win-

dows memory manager is now free to relocate it in physical memory as needed. Unless your DLL needs to run under Windows 3.0 Real mode or is one of those few that actually needs to fix its data in physical memory, you can place this code at the start of any Borland Pascal DLL.

THE ROAD TO CHICAGO When we finally get to Chicago, the next version of Windows, its user interface will no doubt pre-

sent us with a new set of challenges and opportunities. But in the meantime, utilities such as MyGroups can help make the ride less bumpy. □

CHARLES C. EDWARDS, AUTHOR OF THE BOOK *ADVANCED TECHNIQUES IN TURBO PASCAL* (SYBEX, 1987), IS A CONSULTANT WORKING IN WASHINGTON, D.C. HE SPECIALIZES IN DESKTOP OPERATING-SYSTEMS SUPPORT.

GUIDE TO OUR UTILITIES & HOW TO GET THEM

MYGROUPS

PURPOSE: MyGroups lets you change your Program Manager group icons to customized icons.

SETUP: To install MyGroups, copy MYGROUPS.EXE to your hard disk and then add it to your Startup group. Once MyGroups is running, whenever you select the system menu for a Program Manager group, you will see two additional menu items: Change Icon and Unload MyGroups.

When you select Change Icons, you will be presented with a dialog box that is very similar in appearance to the dialog box used to select file icons. You can browse the icons you have on-disk in the usual way, or you can click on Programs to view the icons contained within that group.

To unload MyGroups and restore the default Program Manager group icons, select Unload MyGroups.

REMARKS: MyGroups stores the location of the icon for each group in an .INI file called MYGROUPS.INI. This file can be found in your Windows directory. If you delete or rename a group, MyGroups detects this and makes the appropriate changes to the .INI file. Such changes are not detected, however, if they are made while MyGroups is not loaded. MyGroups will display a message the next time you start it if it encounters a problem.

If you frequently make changes to your groups while MyGroups is not running, you may want to disable the start-up warnings. If you don't want to be notified when the file containing a group icon cannot be found, place the statement WARNICON=0 in the [Warnings] section of MYGROUPS.INI. If you don't want to be warned about groups that were deleted or renamed while MyGroups was not running, put the line WRNGROUP=0 in the same section.

PC Magazine's utilities are available by modem from PC MagNet, our on-line service. PC MagNet is part of ZiffNet, a group of on-line services from Ziff-Davis Publishing Company. ZiffNet is hosted by CompuServe Information Service.

THE FIRST TIME If you've never used ZiffNet, you'll need to find the access number nearest you. Set your communications software to 7 data bits, even parity, no stop bits, and full duplex. Then dial 800-346-3247 with your modem. When the modem connects, press Enter. At the HOST NAME prompt, enter PHONES. Follow the menus and note the closest access number. Or dial 800-635-6225 (voice) for instructions.

HOW TO JOIN ZIFFNET Dial the local access number. At the HOST NAME prompt, enter CIS. At the USER ID prompt, type 177000.5000. When you see the PASSWORD prompt, enter PC*MAGNET. Finally, when you see the ENTER AGREEMENT NUMBER prompt, enter PCMAG94. Current CompuServe members can type GO PCMAG at any CompuServe ! prompt. Once you enter your billing information, you'll see your personal user ID and temporary password.

MEMBERSHIP PRIVILEGES Membership costs \$2.95 per month. You receive free access to PC Magazine Editors' Choice awards, Product Reviews Index, weekly news from PC Week, Buyer's Market, ZiffNet Highlights, the Support Forum, and the current utility (type GO ZNT FREEUTIL). For other services, connect-time charges vary according to modem speed. Billing is based on 1-minute increments. You can also download all of PC Magazine's utilities and tips. Type GO ZNT-TIPS.

Prodigy members can download the utilities from ZiffNet selections on Prodigy for a transfer fee of \$3 per program. Jump 'ziff select' and browse the computing topics for programs.

FREE UTILITY You can download this month's utility, free of charge, from PC Magazine's BBS by dialing 617-231-4450 with your modem. Just enter your name at the prompt and follow the menus.

NO MODEM, NO PROBLEM If you don't have a modem, you can get our utilities by mail. Just send your request with your name, address, and preferred disk size to Public Brand Software, P.O. Box 51315, Indianapolis, IN 46251; fax, 317-856-2086.

COPYRIGHT INFORMATION The programs presented in PC Magazine can be copied but are copyrighted. You may make copies for others if no charge is involved, but making copies or using any portion for any commercial purpose is strictly prohibited.

PC Solutions

TIPS AND TECHNIQUES TO INCREASE YOUR PRODUCTIVITY

HARDWARE

Memory Mystery

After replacing four 1MB 100-nanosecond (ns) SIMMs (single in-line memory modules) with their 70-ns equivalents, I get an error message at power-on that indicates a memory failure at 3E7A3A. With a warm reboot, the message locates the failure at 169A74. The manufacturer says that the higher-speed memory could be causing the problem. Is that possible?

I. H. Crew

Carmen, Oklahoma

PC MAGAZINE: I think it's unlikely that the faster speed of your new memory chips is causing your problem. My understanding is that if memory is too slow for the system, delays in memory access can cause the system to fail. But there's no harm done if the memory contents are ready slightly before the system needs them. Thus, it's likely that your problem lies with the SIMMs themselves, and fortunately this is easy to check.

The power-on error message indicates the address of the last SIMM, and the warm boot address indicates that of the second. By moving the SIMMs around on the motherboard, therefore, you should be able to identify a faulty chip. Start by swapping the physical positions of the third and fourth SIMMs. If the error message at power-on indicates a *different* location—between 200000 and 300000—I'd suspect that there is something wrong with the SIMM that was in the fourth slot and is now in the third. Similar tests with the second and (originally) third SIMM should determine if that SIMM is defective.

If the error messages do not follow the changes in the SIMMs' positions but continue to indicate the same location, it is

possible that the SIMM socket itself was damaged when you changed the memory chips. Alternatively, dust or oxidation may be preventing proper contact between the SIMM and its socket, so check the slots carefully for damage or foreign materials.

If all this fails to solve the problem, putting back 100-ns SIMMs in place of the 70-ns units can't hurt, though I don't expect that this will make any difference.

—Alfred Poor

Proprietary Problems

I'd like to upgrade the local-bus graphics subsystem of my PC compatible to include a Windows accelerator chip. Unfortunately, the system's manufacturer has gone out of business, and my manual makes no mention of the VESA VL-Bus standard. How can I tell if I have a VL-Bus slot or not? Can I add a VL-Bus card, or do I have to use an ISA card?

Craig Bonvechio
Naples, Florida

PC MAGAZINE: Mr. Bonvechio included the model number of his system's motherboard, so I was able to track down its manufacturer. The unfortunate answer is that while his system does have a local-bus graphics system, it does not conform

to the VESA VL-Bus standard.

The VL-Bus uses a Micro Channel-type connector, which is added to the motherboard in line with and adjacent to the standard connectors. (Incidentally, the VL-Bus specification is designed to work with ISA, EISA, and Micro Channel motherboards.) When local-bus designs first became a hot item in the industry, many manufacturers didn't wait for the VL-Bus to become final but rather went ahead with their own creations. As a result, it's not uncommon to find older 486 machines with proprietary local-bus implementations for graphics.

Few, if any, of the newer graphics adapters support the older proprietary bus designs. As a result, the only way you can take advantage of the latest Windows graphics accelerator chips is to add a card that uses the motherboard's main expansion bus. This will normally be an ISA bus design.

There are a number of additional important points to consider before upgrading the graphics system of a proprietary local-bus motherboard. Foremost is whether you can disable the existing graphics adapter circuitry. If your present graphics adapter is located on a separate card, this will not be a problem. Many proprietary designs integrate their local-bus graphics right into the motherboard,

PC SOLUTIONS INDEX

Hardware

Memory Mystery.....	321
Proprietary Problems.....	321
Data Storage Life.....	324

Operating

Environments

Phantom Files in the File Manager.....	324
What Is the Length Of DOS's Path?.....	325

Word Processing

Printing WP 5.1 in Landscape.....	336
--------------------------------------	-----

Spreadsheets

Changing Tooltip Descriptions in Excel 5.....	342
---	-----

Graphics

Two Queries about Font Overload.....	346
---	-----



PC DIRECT
starts here
with
exciting
offers from
top direct
vendors.

See index, page 325.

OUR PRICES HAVE NEVER LOWER.



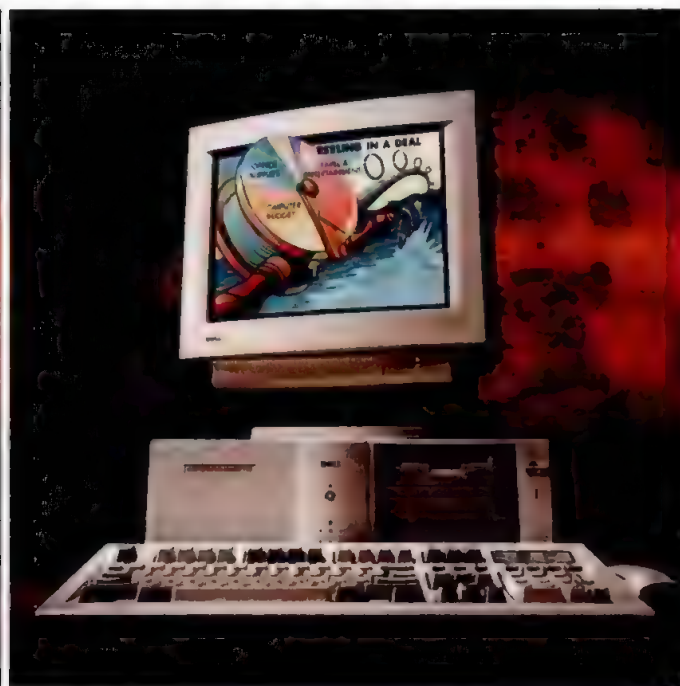
DELL DIMENSION™ XPS P60
A PENTIUM™ PROCESSOR BASED 60MHz SYSTEM

\$1999

BUSINESS LEASE*
\$74/MO.

ORDER CODE #500023

- 8MB RAM
- 340MB HARD DRIVE (13ms)
- VS15 MONITOR (15" CRT, NII)
- PCI VIDEO CARD WITH 1MB VIDEO RAM
- 256KB WRITEBACK CACHE
- ONE DISKETTE DRIVE (3.5")
- SPACESAVER KEYBOARD
- MS-DOS® 6.2/MICROSOFT® WINDOWS™ 3.1/MOUSE



DELL DIMENSION XPS P90
A PENTIUM PROCESSOR BASED 90MHz SYSTEM

\$2599

BUSINESS LEASE*
\$96/MO.

ORDER CODE #500027

- NEW MINI TOWER STYLE AVAILABLE
- 8MB RAM
- 540MB HARD DRIVE (12ms)
- ENHANCED IDE
- VS15 MONITOR (15" CRT, NII)
- PCI VIDEO CARD WITH 1MB VIDEO RAM
- 2X MULTI-SESSION CD ROM DRIVE
- 256KB WRITEBACK CACHE
- ONE DISKETTE DRIVE (3.5")
- SPACESAVER KEYBOARD
- MS-DOS 6.2/MICROSOFT WINDOWS 3.1/MOUSE



pentium

■ Denotes a cool feature which makes this system even more cool. *Prices valid in the U.S. only. Prices and specifications subject to change without notice. *Business leasing arranged by Leasing proprietary interest in the marks and names of others. ©1994 Dell Computer Corporation. All rights reserved.

ES BEEN

**[OUR SERVICE HAS
NEVER BEEN HIGHER.]**



DELL DIMENSION XPS P90
A PENTIUM™ M PROCESSOR BASED 90MHz SYSTEM

\$3899

BUSINESS LEASE
\$140/MO.

ORDER CODE **#500028**

NEW MINI TOWER STYLE
AVAILABLE

16MB RAM

1 GIGABYTE ENHANCED IDE
HARD DRIVE (10ms)

VS17 MONITOR (17" CRT, NII)

64-BIT #9 PCI 2MB
VRAM VIDEO CARD

NEW NEC 3X CD ROM DRIVE
(450KB/SEC. TRANSFER RATE)

• 256KB WRITEBACK CACHE

• ONE DISKETTE DRIVE (3.5")

• SPACESAVER KEYBOARD

• MS-DOS 6.2/MICROSOFT
WINDOWS 3.1/ MOUSE

Lower prices, higher service. The readers of
PC Magazine even chose Dell for their Service and
Reliability Award. Call us. We'll show you.

DELL™

To Order, Call

800-243-2694

In Canada* Call 800-668-3021

Mon-Fri 7am-9pm CT • Sat 10am-6pm CT • Sun 12pm-5pm CT

Keycode #11BNT

© 1999 Dell Computer Corporation. The Intel Inside and Pentium Processor logos and Pentium are trademarks of Intel Corporation. MS-DOS and Microsoft are registered trademarks and Windows is a trademark of Microsoft Corporation. Dell disclaims

however, and with these you must make certain that you can disable this portion.

Next, a new ISA card may not provide significantly better performance than your existing local-bus graphics. Even a relatively unsophisticated proprietary frame-buffer design running at 33 MHz with a 32-bit-wide data bus may be able to hold its own against an accelerator-equipped ISA card, since the latter must communicate with the CPU through a 16-bit-wide data bus at only 8 MHz. Further, some 16-bit graphics cards automatically step down to 8-bit operation if there are any 8-bit interface cards—a secondary monochrome adapter, for example—that uses an address in the same memory block. If at all possible, then, try to test an accelerator card in your system before you commit to purchase.

Finally, bear in mind that motherboards are relatively inexpensive these days. If you can find one that will fit in your existing case and will accept your existing CPU and memory, replacing the motherboard so that you can use a VL-Bus accelerator card may be worthwhile. This may be your least expensive path to a significant performance boost.

—Alfred Poor

HOW TO CONTACT US

Do you have a hardware, software, or systems problem you can't solve? Do you have a tip you think other readers could use? Perhaps you'd like a better understanding of how something works. If so, we invite you to tell us about it. Our experts can give you practical solutions to your problems, provide techniques for using your software and hardware more productively, and help you grasp computer concepts and understand the latest technology.

It's easy to contact us. Just send us your submission (use ASCII format for text files) via the medium that's most convenient for you:

U.S. Mail: Solutions, *PC Magazine*, One Park Ave., New York, NY 10016-5802. (Please send a floppy disk along with a printout.)

Fax: 212-503-5799.

MCI Mail: Solutions, 556-3896

CompuServe: 72241,104.

Internet: 556.3896@mcimail.com.

PC MagNet: Select Submissions to PC Magazine from the main PC MagNet menu. Upload your file to the most appropriate library. If at any time you need help, simply type a question mark (?) and hit Enter; a list of commands will be displayed. If you are not already a member of PC MagNet but would like to join, follow the instructions on page 12 to find your local access number.

CompuServe Members: If you're a CompuServe member, you can join PC MagNet by typing GO PCMAG at any CIS prompt.

For any tip we print, you'll receive \$50 plus a *PC Magazine* T-shirt. We regret that we cannot answer letters individually.

Our Advisors

Douglas Boling is a contributing editor and the author of many utilities, including MBOOT.COM and EMS40.SYS.

Frank J. Derfler, Jr., is senior networking editor and the author of the *PC Magazine Guide to Connectivity*.

Alfred Poor is a contributing editor and the author of *New Life for Old PCs*.

Jeff Prosser is a contributing editor and the author of *DOS 6 Techniques & Utilities*.

Sal Ricciardi is a contributing editor and the author of the *Running FoxPro* books from Microsoft Press.

Nell Rubenking is technical editor and author of *Can Do DOS*,

Can Do Windows, and *PC Magazine Batch File Lab Notes*.

Joe Salemi is a contributing editor and author of the *PC Magazine Guide to Client/Server Databases*.

Luisa Simone is a contributing editor and the author of the book *Microsoft Publisher*.

Craig Stinson is a contributing editor and coauthor of *Running Windows 3.1* and *Running Microsoft Excel*.

M. David Stone is a contributing editor and coauthor of *Word for Windows Companion*, Second Edition.

Ethan Winer is a contributing editor and the author of *PC Magazine BASIC Techniques and Utilities*.

Data Storage Life

? How long can a 3.5-inch floppy disk safely store data? I know that the reliable storage life for data on tape is generally two or three years. Is there any reliable information about the storage life for floppy disks?

Frank Shaw
via PC MagNet

► PC MAGAZINE: I put this question to a number of sources, including a product-support technician at 3M. I was surprised to learn that if you write the data to the

floppy disk using a clean and properly aligned drive, you should be able to read the data indefinitely.

The difference between tapes and floppy disks is that the magnetic medium on a tape is wound on a spool, which places adjacent layers extremely close together. This allows the magnetic fields in one layer to affect the fields in the next, and over time the signal decays.

There is no such close proximity with floppy disks, whether 3.5 inch or 5.25 inch. Thus, the data should remain undisturbed and readable longer than anyone will remember what it was supposed to represent.—Alfred Poor

■ OPERATING ENVIRONMENTS

Phantom Files in the File Manager

? I've found an "undocumented feature" in the Windows File Manager that yields some baffling results. Select Search from the File menu and search for a DOS device name (COM1, LPT2, AUX, NUL, and so forth). The File Manager will report that the "file" exists in each directory searched! Further, if you scan the file information you'll see that all the files were created when you ran the search and are all the same size. These files, however, are phantoms: They don't really exist and can't be opened or deleted.

What really intrigues me about this is the file sizes that are reported: They seem to vary randomly from as small as 112 bytes to more than 50K. Can you tell me what's happening?

Randy Green
Plano, Texas

► **PC MAGAZINE:** Many file-management programs in DOS and Windows will find these phantom files. Some users who discover them react with alarm, imagining that a virus has put a file called NUL, for example, in every directory on their systems. Mr. Green correctly discerned that these are not real files, and that they appear as a result of searching for a filename that matches a DOS device name.

This odd result is produced by a low-level DOS function called FindFirst. Pass FindFirst a file specification, possibly including wildcards, and it returns the name of the first matching file along with the file's attributes (hidden, read-only, and so on), date and time stamp, and size. If no files match, it returns an error code.

FindFirst behaves oddly, however, when it receives a DOS device name as the filename, regardless of the extension. FindFirst always reports that the file *does* exist, unless the device name was preceded by a nonexistent directory. The associated file information is spurious. As you've noted, the date and time stamp is the current date and time. The value re-

ported as file size is actually the segment address of the DOS internal driver for the device. Mr. Green mentioned sizes from 112 bytes to more than 50K. Most of the standard DOS drivers reside in segment 0070h, which is 112 in decimal. A user-installed driver loaded in upper memory might well reside at segment C800h, which is 50K in decimal.

—Neil J. Rubenking

What Is the Length of DOS's Path?

❓ My user manual for the DOS 6.0 upgrade states, "MS-DOS recognizes paths up to 67 characters." I seem to recall that DOS 5.0 and earlier versions had a limit of 127 characters. Has there been a change in DOS 6.0?

Jerry Kiral

Minneapolis, Minnesota

❓ There seems to be an error regarding the length of the path in DOS 6.0 described in the October 26, 1993, column.

Mine stops working when the length exceeds 64 characters total. I had to find another way to load several of my programs. Is the 122 character length really valid? I know what the books and help say, but it doesn't seem to be true.

E. Samuel Levy

San Diego, California

► **PC MAGAZINE:** The word *path* has two different meanings under DOS. It refers to a chain of directories starting at the root—for example, C:\WINDOWS\SYSTEM. It also refers to the list of directories in which DOS seeks executable programs. This list is created by the PATH command and stored in the environment variable named path.

When the DOS manual says that DOS recognizes paths of up to 67 characters long, it's talking about the first meaning. Since one of those 67 characters is a terminating ASCII zero character, the limit is effectively 66 characters. The batch file P1.BAT (Figure 1) builds a path of this maximum length, displays it along with a "ruler" to show its length, and then

SOFTWARE ■ PERIPHERALS ■ SYSTEMS ■ COMPONENTS ■ TOLL-FREE ■ ADVICE



Premier Superstores
Top Direct Marketers
Manufacturers of
Systems, Software,
and Peripherals

.....

If it's sold direct,
you'll find it here.

INDEX

SYSTEMS

AMS	377
Austin Direct	351
COMPUTER DISCOUNT	
WAREHOUSE	338
Dell Computer Systems	322
Expo Tech/Vtech	366
FOSA	382
Midwest Micro Peripherals	328
PCs Compleat	370
TC Computers	361
USA Flex	362

SOFTWARE/PERIPHERALS/ COMPONENTS

American Small Business	381
Arlington Computer Products	347
Bulldog Computer Products	374

Computability	326
COMPUTER DISCOUNT	
WAREHOUSE	338
DEE ONE SYSTEMS	376
First Source International	352
H. Co Memory Upgrades	383
Hi Tech Components	350
Kenosha Computer Center	378
LA Trade	356
Megahaus	355
MIDLAND COMPUTERMART	354
Midwest Computer Works	360
Notis Systems	384
PC Connection	343
PC Zones	358
Pinnacle Micro	337
Publishers Toolbox	375
SPSS	380
Sunshine Computers	357
Valueline	379

SOFTWARE ■ PERIPHERALS ■ SYSTEMS ■ COMPONENTS ■ TOLL-FREE ■ ADVICE



MODEMS

IMAGINATION
NETWORK

6 HOURS FREE
with
the purchase of any modem

NEW LOWER PRICES!

V.32 bis Send/Receive 14,400 for DOS or Win	
Internal / External	\$99 / \$129
w/ Voice Int/Ext	\$119 / \$139
Zoom 14.4 PKT / with Voice	\$179 / \$265
V Fast Class 28.8	
Internal	\$139
External	\$165
Zoom 14.4 with RPI	
PC Int.	\$89
Ext. EX	\$119
14.4 PCMCIA Cell	
FREE DEL	\$195

Supra Corporation

SupraFaxModem Internal 24/96 NEW!	\$53
Supra 2400 External	\$59
SupraFaxModem 144LC, Class 1 only	
Ext. DOS / Windows	\$125
SupraFaxModem V.32 bis, Internal	\$109
SupraFaxModem V.32 bis, Ext.	
w/ Fax Software, DOS/Win	\$172
Supra FaxModem 288i Int/288 Ext	\$205/\$235
Supra Express 14.4 with RPI	\$83

US Robotics

Sportster 14.4 with Fax Int / Ext	\$115 / \$133
Sportster 28.8 Int / Ext	\$205 / \$219
WorldPort Fax/Data 14.4 PCMCIA - FREE DEL	\$199
Courier V.32 Turbo with Fax Int / Ext	\$329/\$349
Courier V.34 Ready S/R Int / Ext	\$375/\$419
Courier V.34 Dual Standard Int / Ext	\$515/\$549

MOTOROLA

CELLTALK 14.4 PCMCIA	\$299
FaxTalk II 1.4 kbps Int/Ext	\$115/\$135

AT&T

14.4 Fax Modem Int/Ext	\$149/\$185
AT&T Notebook PCMCIA 14.4 FREE DEL	\$299
AT&T DataPort 2001	\$399

VIDEO BOARDS

DIAMOND

Speedstar Pro 1MB ISA / VLB	\$115/\$115
Stealth 24 ISA / VLB	\$155/\$155
Stealth Pro SVGA ISA 1MB / 2MB	\$215/\$289
Stealth Pro VLB 1MB/2MB	\$219/\$295
Stealth 32 VLB 2MB	\$239
Stealth 64 2MB PCI / VLB	\$325/\$325
Stealth 64 4MB PCI / VLB	\$465/\$465
Viper VLB 2MB / PCI 2MB	\$329/\$349

ATI

ATI Graphics Wonder Mach ISA or VLB	\$119
ATI Graphics plus 2 MB	\$195
ATI Ultra Pro 2 MB ISA or VLB	\$259
ATI Ultra Pro EISA 2MB	\$299
ATI Ultra Pro Turbo 2MB ISA or VLB or PCI	\$335
Graphics Pro Turbo 4MB ISA or VLB or PCI	\$569

3D

GXE64 PCI 1MB / 2MB	\$175 / \$249
GXE64 VLB 1MB / 2MB	\$175 / \$249
GXE64 Pro PCI	\$365
9GXE, 1280 x 1024 NI, SVGA:	
LVL 10, 1MB ISA / VLB	\$239 / \$249
LVL 11, 2MB ISA / VLB	\$349 / \$349
LVL 12, 3 MB ISA/VLB	\$429 / \$429

GRAPHICS

Graphite ISA 1MB HG210	\$195
Graphite Power ISA 1MB PG310	\$199
Graphite Power VLB 1MB PG610	\$229
Graphite Power ISA 2MB PG420	\$289
Graphite Power VLB 2MB PG720	\$289
Graphite Power PCI 1MB 2MB	\$229 / \$339
Dynalite Power 2MB ISA/VLB	\$209
Dynalite Pro ISA 1MB/2MB	\$155/\$195
Dynalite VL Pro SVGA 1MB / 2MB	\$149 / \$199

V

928MOVIE 1MB / w/ sound	\$305' / \$395'
928MOVIE 2MB / w/ sound	\$395' / \$485'

MONITORS

NEC PC	
SVGA, 14" 28mm dot pitch,	\$305
1024x768 non-int	
2V 14", 28mm dot pitch,	\$299
1024x768	
3V, 15" 28mm dot pitch,	\$429
1024x768 non-int	

3FGs, 15" 28mm dot pitch, 1024x768 non-int	\$549
4FGs, 15" 28mm dot pitch, 1024x768 non-int	\$599
5FGs, 17" 28mm dot pitch, 1024x768 non-int	\$955
5FGp, 17" 28mm dot pitch, 1280x1024	\$1,089
6FGp, 21" 28mm dot pitch, 1280x1024	\$1,959

NOKIA Multigraph 449E	
44BS, 14" 28DP, 1024x768, NI	\$389
449E 15" 28DP, 1024x768, NI	\$485
447L 17" 28DP, 1024x768, NI	\$695
447B 17" 28DP, 1024x768, NI	\$689
447X 17" 28DP, 1280x1024, NI	\$1,029
445M 21" 28DP, 1600x1200	\$1,919
445X 21" 28DP, 1600x1200	\$2,479

NANAO	
F3401W / F5501	\$649 / \$955
F550W / F560W	\$1,035 / \$1,295
T5601 / F760W / T6601	\$1,529 / \$1,979 / \$2,169

CTX	
6488ES, 14", 28DP, 1024x768	\$235
1451GM, 14", 28DP, SVGA 1024x768	\$265
1562GM, 15", 28DP, SVGA 1024x768	\$335
1565GM, 15", 28DP, SVGA 1024x1024	\$355
1765GM, 17", 28DP, SVGA 1280x1024	\$689
1785GM, 17", 26DP, SVGA 1600x1280	\$809

NETWORKING

ComputAbility Starter Kits
Peer to Peer Starter Kits (Coax or TPI)
2 User Kit Includes: 2 user of software, 2 NE 2000
combo adapters, 2 25' twisted pair cable, 25' coaxial
cable, 8 (2) 50 Ohm terminators
Artnet
LANtastic 6.0 2 user \$345.00

NOVELL	
Personal Network 2 user	\$289.00
MICROSOFT	
MS Windows for Workgroups Add On 2 user	\$295.00

*Multiple user starter kits featuring Centrium,
Windows NT, and Novell Networks at unbelievably LOW
PRICES!! CALL!!

Network Interface Cards	
ARTISOFT	
Node Runner S2000C Coax single	\$71.00
Node Runner S2000A Combo	\$98.00
Node Runner S2000T 10Base-T single	\$71.00
3COM	
Etherlink III 16 bit Combo	\$129.00
Etherlink III 16 bit Coax	\$115.00
Etherlink III 16 bit 10Base-T	\$115.00
SMC	
SMC Ultra Elite 16 bit Combo	\$119.00
SMC Ultra Elite 16 bit Coax	\$99.00
SMC Ultra Elite 16 bit 10Base-T	\$99.00
NATIONAL	
Infomover NE2000+ Combo 16 bit	\$87.00
Infomover NE2000+ C 16 bit Coax	\$89.00
Infomover NE2000+ T 16 bit 10Base-T	\$87.00
Infomover NE4100C-1 16 bit PCMCIA Coax	\$165.00
Infomover NE4100T-1 16 bit PCMCIA 10BT	\$165.00

Operating Systems	
NOVELL	
Novell Personal Networks:	
Single User / 5 User	\$85.00 / \$255.00
Novell Networks 3.11:	
5 User PC or CD	\$585.00
10 / 25 / 50 / 100 User PC or CD	CALL
Novell Networks 4.02:	
5 User CD	\$769.00
10 / 25 / 50 / 100 User CD	CALL
Artnet	
Simply LANtastic: Software Only	\$49.00
LANtastic Network Operating System 6.0:	
Single user / 5 user	\$74.95 / \$315.00
10 / 25 / 50 / 100 user	CALL
Comnet	
5 / 10 User Server	\$599 / \$1,169
25 / 50 / 100 User Server	CALL
Microsoft	
Microsoft Windows NT	
Server / Single License	\$299.00 / \$265.00
20 / 100 User License	CALL
Microsoft Win for WG 3.11 single user	\$137.95
3.11 Add-on for Windows	\$47.95
3.11 Add-on License - 1 User	\$38.95

PRINTERS

FREE
CardShop
Plus with select
printers!
Call for details!

EPSON	
AP1250 / AP1250	\$119 / \$182
AP 3280 / with Color	\$179/\$205
LX-300 / FX-870 / FX-1170	\$165 / \$299 / \$355
DFX-5000+ / DFX-8000	\$1,399 / \$2,299
LD-570+ / LD-1070+	\$245 / \$359
LD-870 / LD-1170 / LQ-2550	\$439 / \$599 / \$879
Stylus 400 NEW / 800+ NEW	\$237 / \$262
Stylus Color NEW	\$555
Action Laser Printer 1100 / 1500 / 1800	\$479 / \$649 / \$939

NEC	
Silentwriter 1057	\$1,349
SuperScript 610	\$469

FARGO	
Primera / Pro Color	\$695 / \$1,359

OKIDATA	
ML320 / ML321	\$299 / \$419
500 / 501	\$419 / \$569
385 / 395C	\$949 / \$1,019
810 / 830+ / 880	\$895 / \$1,129 / \$1,229
400e / 410e	\$489 / \$649

QUANTITIES LIMITED

HEWLETT PACKARD	
HP DeskJet 520 / HP DeskJet 560C	\$289 / \$359
HP DeskJet 310, alone/ cutsheet feeder	\$299 / \$359

TEXAS INSTRUMENTS	
microMac Ink Jet / microMac Color Ink Jet	\$235 / \$365
microWriter Basic, 5PPM Laser	\$509
microWriter PS23 5PPM with PS	\$679
microLaser Pro 800 PS23	\$1169

Canon	
BJ200E / BJ230 Ink Jet	\$259/\$335
BJ100 / BJ105X	\$205 / \$239
BJC 4000 Color Laser	\$489
BJC 800 Color Ink Jet	\$539
LBP 430 / 880 Laser	\$579/\$1,299

digital	
DECwriter 500i Ink Jet	\$369
DECwriter 1800 Laser	\$735
DECwriter 5100 Laser	\$1,439

POWER SUPPLY

Smart 400 / 500 / 600	\$279 / \$285 / \$309
Smart 750 / 900 / 1250	\$379 / \$439 / \$589
Power Alert Plus Novel/Unit	\$58 / \$105
Power Adviser DCS	\$62
BC Series Standby UPS Systems	
BC 250 / 400 / 500	\$95 / \$149 / \$179
BC 500LAN / 600LAN	\$189 / \$239
BC 900LAN / 1250LAN	\$359 / \$455
OmniPower Line Interactive UPS	
OMNI 500LAN/OMNI 600LAN	\$249/\$289
APC	
200 / 280 / 400	\$89 / \$99 / \$155
450 / 600	\$185 / \$255
900 / 1250	\$359 / \$469
400	\$275
600 / 900 / 1250	\$329 / \$469 / \$585
Power Manager	\$67

HARD DRIVES

Seagate	
ST-3120A IDE	\$165
ST-3145A/3243A IDE	\$189/\$179
ST-3290A/3391A IDE	\$189/\$219
ST-3390A IDE	\$255
ST-3491A/3655A IDE	\$235/\$335
ST-3390N/3550N/3655N	\$349/\$359/\$409
FREE DELIVERY:	
ST-31200N SCSI	\$899
ST-11900N	\$1,475
ST-11950N / 12400N	\$1,475 / \$1,289
ST-12550N	\$1,379
ST-1465N/42100N	\$1,099/\$1,399
ST-42400N/43400N	\$1,669/\$2,049

Maxtor	
IDE 7171A / 7273	\$189/\$249
IDE 7345A/7405A/7546A	\$215/\$249/\$329
SCSI 7290S	\$239

Quantum	
170 IDE / SCSI	\$189 / \$209
LPS 270 IDE / SCSI	\$235 / \$255
540 IDE / SCSI FREE DELIVERY	\$379 / \$409
PD 1800 SCSI FREE DELIVERY	\$995

MICROPLUS	
FREE DELIVERY (contiguous 48 states)	
1926 / 1936 SCSI	\$1,399/\$2055
2217 SCSI / 2217 IDE	\$999/\$999
2210AV / 2217AV	\$845/\$1055
4110 SCSI / 4410 IDE	\$899 / \$999

WESTERN DIGITAL	
AC-1210 / 2250	\$199/\$219
AC-2340 / 2420 / 2540	\$255/\$279/\$379
AC-2730 / 31080 FREE DELIVERY	\$609/\$789

CONTROLLERS

adaptec	
1522 SCSI Direction Kit 16 Bit Standard SCSI with Floppy Support & Drivers	\$135
1522 SCSI Direction PLUS Kit	\$189
1542CF Single	\$195
1542CF SCSI Master Kit / PLUS	\$249/\$305
2742 Single NEW	\$289
2742T Kit NEW	\$349
APA 358 Plus Mini SCSI	\$175
Sim SCSI APA-460 PCMCIA FREE DEL	\$269
AVA 1505 16 bit SCSI / 1515 CD only	\$59/\$85
2940 PCI Kit	\$289
AHA 2842A Kit	\$255

glogic NEW!	
Fast SCSI ISA/FL	\$119/\$129
Fast SCSI VESA Local/FL	\$169/\$205
Fast SCSI PCMCIA	\$195
Fast SCSI IQ-PCI	\$319

FUTURE	
1680 SVP-ISA	
TMC-860 MCD CD ROM Kit	\$55
1680 SVP-ISA, 16 bit SCSI 2 with floppy support & CD ROM SCSI support	\$129
TMC 3280 PCI	\$139

DTK	
DTK PTI 227, 2 Serial, 1 parallel, 1 game port, 2 floppy disk controller, 2 embedded hard disk drive adapter	\$29

SPEAKERS

YAMAHA	
AC-3 NEW!	\$175
ACS-50 / 150	\$72 / \$109
ACS-100 / 300	\$98 / \$229

LOGITECH	
Audio II Speakers	\$129

YAMAHA	
Acoustic Research	
AR Partner 22 Black	\$69
AR Partner 42 Gray / 622 Gray	\$119 / \$185
AR Partner 570 Gray	\$245

The Service You Remember



Call or write for your Free
MidWest Micro catalog.

MidWest Micro

SYSTEMS

1-800-682-7256

PERIPHERALS

1-800-972-8822

Fill 'er Up

MidWest Micro has never forgotten what full service is all about. For more than a decade, we've been attending to you with premium products, the lowest prices and unbeatable customer service. And even though we hate to toot our own horn, we're proud of the awards we've driven away with over the years—including 14 Computer Shopper Best Buy Awards and PC Computing's Five Star Rating for outstanding service and support.

The Real Warranty — Not Just A Lot Of Hot Air

Tired of computer companies with flat, tread-bare warranties? Check out MidWest Micro's **Real Warranty** with three full years of bumper-to-bumper system coverage.

The first company to offer such an extensive warranty, MidWest Micro completely covers your Elite Desktop System and all its components — even the monitor and hard drive.

Squeaky-Clean Guarantee

When you buy from MidWest Micro, you'll feel confident in your decision. That's because in addition to the Real Warranty, your Elite System is backed by a **30-Day Money-Back Guarantee**. When it comes to customer satisfaction, we don't miss a spot. And if your system ever *does* need a tune up, our **Immediate Parts**

Replacement Policy will fix you right up.

Phone-Line Freeze Up?

Don't be afraid to call and ask for help — it's easy! MidWest Micro provides **Lifetime Toll-Free Technical Support** with your Elite purchases. Qualified technicians are standing by to answer all of your questions quickly and accurately. And for round-the-clock access to the latest drivers and utilities, pull up to our **On-Line Bulletin Board Service** and simply download the information you need.

We'll Pump You Up

You don't have to go back in time to get this kind of attention. At MidWest Micro, we'll even custom configure your Elite System with your choice of peripherals and one of five attractive case designs. Call today and take a nostalgia trip with MidWest Micro — your one-stop location for the latest technology and good old-fashioned service.

MidWest Micro





**Hot, Fast And
To Order**

Have it Your Way

Get ready for the hottest items on MidWest Micro's menu. Fast, fresh and topped with features, these Intel-based Elite Systems are just what you've been craving. And since everyone has different tastes, we'll configure your system the way *you* like it. Want extra RAM, a double-speed CD-ROM drive or a sound card?...no problem. Just place your order and we'll bring it right out to you.

Tonight's Special...

Feast your eyes on Elite's Pentium PCI Systems. These high-tech dishes feature sizzling processors and mouth-watering PCI bus architecture. And once the gang sees MidWest Micro's low prices on Pentium Systems, they'll never order "the usual" again. With PCI (Peripheral Component Interconnect) technology, your information is cruisin' on a fast 32-bit data path - perfect for full-motion video and peripheral expansion. Add a 60, 66 or 90 MHz Intel Pentium processor, and you've got more than enough power to go around.

Hungry For Value?

Try an Elite Slimline Value System. Each of these affordable Elites is served in an attractive Slimline case that conserves desktop space. You won't find a larger helping of features at such a low price. Our Elite VESA and PCI Systems will also whet your appetite with advanced local bus technology and plenty of high-tech toppings. Talk about fast food, these systems reach clock-doubling speeds up to 66 MHz! MidWest Micro is *your* high-performance hangout - call (or honk twice) for an Intel-based Elite System today.

If you think a faster system that conserves energy is a tall order, you haven't seen MidWest Micro's Elite P5-90 Systems. Powerful 90 MHz processors and PCI Local Bus technology make P5-90s the fastest systems on the menu - but they still manage to run cooler and consume less power.

"Yeah, give me a computer system with everything, a side order of RAM, a large hard drive - and make it fast!"



Made

MidWest Micro

SYSTEMS

1-800-682-7256

PERIPHERALS

1-800-972-8822

All Shook Up

Over The SoundBook



Top 10 On Your Elite Parade

1. Notebook of Love
2. Multimedia is Here to Stay
3. Be-Bop-A-Lightweight
4. Sound Dog
5. Clock Speeds of Fire
6. Come MidWest Micro with Me
7. Let the Good Tunes Roll
8. Dual-Scan Shoes
9. Shake, Rattle and RAM
10. The Great Portable

Yakety Yak—This Elite Talks Back

You don't have to drop coins in the Elite SoundBook to hear what it has to say – just listen. Complete with a built-in microphone and speaker, this high-performance notebook has enough audio power to wake up little Susie. It even comes with software that lets you record, store and playback voices, sounds or music. And since it features a powerful Intel processor, Advanced Power Management and lots of RAM-a-lam-a-ding-dong, Elite's mini jukebox is sure to be a hit at your next sock hop.

Whole Lotta Choices Goin' On

MidWest Micro knows that no two be-boppers are alike. That's why we offer a variety of SoundBook configurations with different screens, processors and hard drives. All you have to do is make your selection – maybe you'd like to hear E-7, a 486SX-33 monochrome SoundBook guaranteed to start your saddle shoes tapping. Or you may prefer J-5, a dual-scan DX4-100 with a 520 Mb hard drive and processing speeds faster than Elvis' Pelvis. Whether you're in the mood to Stroll, Jitterbug or La Bamba, we've got a SoundBook that's playing your song.

Video That Knocks Your Socks Off

The Elite SoundBook is also topping the charts with video performances in monochrome, dual-scan and active-matrix screens. For a little black and white with your rock and roll, try a monochrome SoundBook with crisp resolutions that score big on the Bandstand. Also a Billboard favorite, the large 10.3" dual-scan version uses affordable dual-scan color technology for less shadowing and sharper images. Choose an active-matrix screen, and you're sure to find your thrill with faster response times and a spectrum of vivid colors – from blues bluer than Blueberry Hill to purples fit for a flying people-eater. For audio and video in perfect harmony, call MidWest Micro and request your SoundBook today.

Not Quite Ready To Rock?

If you're looking for something with a little less volume, Elite's 486SX SubNote may be for you. Even though it can't play the top ten, this 3.9 lb. computer has plenty of other hit features such as a nickel-metal hydride battery, Advanced Power Management and your choice of dual-scan or monochrome screens.

For portable computing that really rocks, check out the Elite SoundBook. Aside from its built-in microphone and speaker, this tiny vocalist features Local Bus video, a powerful nickel-metal hydride battery and plenty of configuration elements to choose from – including a 10.3" display, 520 Mb hard drive and processing speeds up to 100 MHz.



MidWest Micro

SYSTEMS

1-800-682-7256

PERIPHERALS

1-800-972-8822

PENTIUM PCI SYSTEMS

P5-60 \$1999

- #008613
- Intel 60 MHz Pentium™ Processor
- 8 Mb RAM, 256 Kb Cache
- 428 Mb IDE Hard Drive
- PCI Fast IDE Interface
- PCI Local Bus Graphics with 1 Mb
- Double Speed CD-ROM Drive
- 3.5" Disk Drive
- 15" SVGA .28 N/I Multi-Scan Color Monitor with Hitachi CRT
- 8-Bay Mini-Tower Case
- 4 ISA, 2 PCI & 1 PCI/ISA Slots
- Signature 101-Key Enhanced Keyboard
- Microsoft Mouse
- MS-DOS 6.22 and WFW 3.11
- MS Works Multimedia Edition 3.0
- The Real 3 Year Warranty



pentium
PROCESSOR

P5-66 \$2499

- #008614
- Intel 66 MHz Pentium Processor
- 8 Mb RAM, 256 Kb Cache
- 428 Mb IDE Hard Drive
- PCI Fast IDE Interface
- PCI Local Bus Graphics with 2 Mb
- Double Speed CD-ROM Drive
- Microsoft 3 Disk CD-ROM Software Library - Encarta™, Works™ & Money™
- 16-Bit Stereo Sound Card
- Altec Lansing Digital Quality Speakers
- Internal 14.4 S/R Fax Modem
- 3.5" Disk Drive
- 15" SVGA .28 N/I Multi-Scan Color Monitor with Hitachi CRT
- 8-Bay Mini-Tower Case
- 4 ISA, 2 PCI & 1 PCI/ISA Slots
- Signature 101-Key Enhanced Keyboard
- Microsoft Mouse
- MS-DOS 6.22 and WFW 3.11
- MS Works Multimedia Edition 3.0
- The Real 3 Year Warranty

P5-60 \$2399

#008615

P5-66 \$2799

- #008616
- Intel 66 MHz Pentium Processor
- 16 Mb RAM, 256 Kb Cache
- 528 Mb IDE Hard Drive
- PCI Fast IDE Interface
- PCI Local Bus Graphics with 2 Mb
- Double Speed CD-ROM Drive
- Internal 14.4 S/R Fax Modem
- 3.5" Disk Drive
- 15" SVGA .28 N/I Multi-Scan Color Monitor with Hitachi CRT
- 8-Bay Middle-Tower Case
- 4 ISA, 2 PCI & 1 PCI/ISA Slots
- Signature 101-Key Enhanced Keyboard
- Microsoft Mouse
- MS-DOS 6.22 and WFW 3.11
- MS Works Multimedia Edition 3.0
- The Real 3 Year Warranty

P5-90 \$2999

- #008617
- Intel 90 MHz Pentium Processor
- 16 Mb RAM, 256 Kb Cache
- 528 Mb IDE Hard Drive
- PCI Fast IDE Interface
- PCI Local Bus Graphics with 2 Mb
- Double Speed CD-ROM Drive
- Internal 14.4 S/R Fax Modem
- 3.5" Disk Drive
- 15" SVGA .28 N/I Multi-Scan Color Monitor with Hitachi CRT
- 8-Bay Middle-Tower Case
- 4 ISA, 2 PCI & 1 PCI/ISA Slots
- Signature 101-Key Enhanced Keyboard
- Microsoft Mouse
- MS-DOS 6.22 and WFW 3.11
- MS Works Multimedia Edition 3.0
- The Real 3 Year Warranty

P5-90 \$3499

- #008618
- Intel 90 MHz Pentium™ Processor
- 16 Mb RAM, 256 Kb Cache
- 528 Mb IDE Hard Drive
- PCI Fast IDE Interface
- PCI Local Bus Graphics with 2 Mb
- Double Speed CD-ROM Drive
- Internal 14.4 S/R Fax Modem
- 3.5" Disk Drive
- 17" .26 1600 x 1280 Exact Match Color Monitor
- 10-Bay Full-Tower Case

- 4 ISA, 2 PCI & 1 PCI/ISA Slots
- Signature 101-Key Enhanced Keyboard
- Microsoft Mouse
- MS-DOS 6.22 and WFW 3.11
- MS Works Multimedia Edition 3.0
- The Real 3 Year Warranty

P5-90 \$3999

#008619

With 1 Gb SCSI HDD and Internal 28.8 S/R Fax Modem

VESA AND PCI SYSTEMS

DX2-66 \$1399

- #008606
- Intel 486DX2-66 Processor
- 4 Mb RAM, 128 Kb Cache
- 340 Mb IDE Hard Drive
- 32-Bit VESA Local Bus Graphics w/1 Mb
- 32-Bit VESA Local Bus IDE
- 9624 Internal S/R Fax Modem
- 3.5" Disk Drive
- 14" SVGA .28 N/I Color Monitor with Hitachi CRT
- 8-Bay Mini-Tower Case
- 5 ISA & 3 VESA/ISA Slots
- 101-Key Enhanced Keyboard
- High-Resolution Mouse
- MS-DOS 6.22 and WFW 3.11
- EPA Energy Star Compliant
- MS Works For Windows 3.0
- The Real 3 Year Warranty

SX-33 \$1199

#008603

DX-33 \$1359

#008604

DX2-50 \$1359

#008605

DX2-66 \$1799

- #008609
- Intel 486DX2-66 Processor
- 8 Mb RAM, 128 Kb Cache
- 340 Mb IDE Hard Drive
- 32-Bit VESA Local Bus Graphics w/1 Mb
- 32-Bit VESA Local Bus IDE
- Double Speed CD-ROM Drive
- Internal 14.4 S/R Fax Modem
- 3.5" Disk Drive
- 15" SVGA .28 N/I Multi-Scan Color Monitor with Hitachi CRT
- 8-Bay Mini-Tower Case
- 5 ISA & 3 VESA/ISA Slots
- 101-Key Enhanced Keyboard
- High-Resolution Mouse
- MS-DOS 6.22 and WFW 3.11
- EPA Energy Star Compliant
- MS Works Multimedia Edition 3.0
- The Real 3 Year Warranty

DX-33 \$1759

#008607

DX2-50 \$1759

#008608

DX2-66 PCI \$1799

- #008610
- Intel 486DX2-66 Processor
- 8 Mb RAM, 256 Kb Cache
- 340 Mb IDE Hard Drive
- PCI Local Bus Graphics with 1 Mb
- Double Speed CD-ROM Drive
- 3.5" Disk Drive
- 14" SVGA .28 N/I Color Monitor with Hitachi CRT
- 8-Bay Mini-Tower Case
- 3 ISA, 2 PCI & 1 PCI/ISA Slots
- Signature 101-Key Enhanced Keyboard
- Microsoft Mouse
- MS-DOS 6.22 and WFW 3.11
- EPA Energy Star Compliant
- MS Works Multimedia Edition 3.0
- The Real 3 Year Warranty

DX2-66 PCI \$1999

- #008612
- Intel 486DX2-66 Processor
- 8 Mb RAM, 256 Kb Cache
- 528 Mb IDE Hard Drive
- PCI Local Bus Graphics with 1 Mb
- Double Speed CD-ROM Drive
- 9624 Internal S/R Fax Modem
- 3.5" Disk Drive
- 15" SVGA .28 N/I Multi-Scan Color Monitor with Hitachi CRT
- 8-Bay Mini-Tower Case
- 3 ISA, 2 PCI & 1 PCI/ISA Slots
- Signature 101-Key Enhanced Keyboard
- Microsoft Mouse
- MS-DOS 6.22 and WFW 3.11
- EPA Energy Star Compliant
- MS Works Multimedia Edition 3.0
- The Real 3 Year Warranty

DX-33 PCI \$1979

#008611



EPA POLLUTION PREVENTER

SLIMLINE VALUE SYSTEMS

HOME PC \$1499

- #008601
- Intel 486SX-33 Processor
- 4 Mb RAM, 128 Kb Cache
- 340 Mb IDE Hard Drive
- 32-Bit Local Bus Graphics with 1 Mb
- 32-Bit Local Bus IDE
- Double Speed CD-ROM Drive
- Microsoft 3 Disk CD-ROM Software Library - Encarta™, Works™ & Money™
- 16-Bit Stereo Sound Card
- Digital Quality Speakers
- 9624 Internal S/R Fax Modem
- 3.5" Disk Drive
- 14" SVGA .28 N/I Color Monitor with Hitachi CRT
- Slimline Case
- 4 ISA & 1 VESA/ISA Slots
- 101-Key Enhanced Keyboard
- Microsoft Mouse
- MS-DOS 6.22 and WFW 3.11
- EPA Energy Star Compliant
- MS Works Multimedia Edition 3.0
- The Real 3 Year Warranty

HOME PC \$1999

- #008602
- Intel 486DX2-66 Processor
- 8 Mb RAM, 128 Kb Cache
- 428 Mb IDE Hard Drive
- 32-Bit Local Bus Graphics with 1 Mb
- 32-Bit Local Bus IDE
- Double Speed CD-ROM Drive
- Microsoft 3 Disk CD-ROM Software Library - Encarta™, Works™ & Money™
- 16-Bit Stereo Sound Card
- Digital Quality Speakers
- 14.4 Internal S/R Fax Modem
- 3.5" Disk Drive
- 15" SVGA .28 N/I Multi-Scan Color Monitor with Hitachi CRT
- Slimline Case
- 4 ISA & 1 VESA/ISA Slots
- 101-Key Enhanced Keyboard
- Microsoft Mouse
- MS-DOS 6.22 and WFW 3.11
- EPA Energy Star Compliant
- MS Works Multimedia Edition 3.0
- The Real 3 Year Warranty

Monitor Upgrade

Ask your sales representative how you can upgrade your monitor to a 15" or 17" Elite monitor.

14" to 15" \$89
14" to 17" \$419
15" to 17" \$319

All Systems with a CD-ROM include TestDrive CD Software

Elite SoundBook

- Intel® 486, DX2 or DX4 Processor
- 4 Mb RAM (expands to 20 Mb)
- 9.5" Mono, 10.3" Dual Scan, or 9.5" Active Matrix VGA Display
- Local Bus Video with 1 Mb Video Display
- Business Audio Features Including: Built-in Microphone & Speaker External Jacks for Line In & Line Out
- 3.5" Built-in Disk Drive
- User Replaceable Hard Drive
- Two Type II/One Type III PCMCIA Slot
- Built-in Trackball
- NiMH Battery & AC Adapter
- Advanced Power Management with SMI
- One Parallel & One Serial Port
- External VGA & Keyboard Port
- MS-DOS® 6.2 & WFW™ 3.11
- Lotus Organizer™
- Microsoft Works For Windows 3.0
- Weight: Mono - 6.2 lbs. Color - 6.7 lbs.
- Carrying Case
- One Year Manufacturer's Warranty



* Ask your MidWest Micro sales representative about additional hard drive, screen and processor options.

Dual Scan Color SoundBook

- 486SX-33 with 260 Mb HDD**
#007328 **\$1999**
- 486DX-33 with 260 Mb HDD**
#007329 **\$2199**
- DX2-50 with 340 Mb HDD**
#007330 **\$2299**
- DX2-66 with 520 Mb HDD**
#007331 **\$2499**
- DX4-75 with 340 Mb HDD & 8 Mb of RAM**
#007332 **\$2799**
- DX4-100 with 520 Mb HDD & 8 Mb of RAM**
#007333 **\$2999**
- DX4-100 with 520 Mb HDD, 12 Mb of RAM, PCMCIA 14.4 Fax Modem & PCMCIA Ethernet Adapter**
#008003 **\$3499**
- DX4-100 with 520 Mb HDD, 20 Mb of RAM, PCMCIA 14.4 Fax Modem & PCMCIA Ethernet Adapter**
#008004 **\$3999**

Monochrome SoundBook

- 486SX-33 with 260 Mb HDD**
#007334 **\$1499**
- 486DX-33 with 260 Mb HDD**
#007335 **\$1699**
- DX2-50 with 340 Mb HDD**
#007336 **\$1799**
- DX2-66 with 340 Mb HDD & 8 Mb of RAM**
#008001 **\$1999**
- DX4-75 with 520 Mb HDD, 8 Mb of RAM & PCMCIA 14.4 Fax Modem**
#008002 **\$2499**

Active Matrix SoundBook

- DX2-66 with 340 Mb HDD & 8 Mb of RAM**
#007337 **\$3499**
- DX4-75 with 520 Mb HDD & 8 Mb of RAM**
#007338 **\$3799**
- DX4-100 with 520 Mb HDD, 8 Mb of RAM & PCMCIA 9624 S/R Fax Modem**
#007339 **\$3999**
- DX4-100 with 520 Mb HDD & 20 Mb of RAM**
#008005 **\$4499**
- DX4-100 with 520 Mb HDD, 20 Mb of RAM, PCMCIA 14.4 Fax Modem & PCMCIA Ethernet Adapter**
#008006 **\$4999**

Options

4 Mb RAM Card	#005976	\$219
8 Mb RAM Card	#005977	\$469
16 Mb RAM Card	#005978	CALL
Car Adapter	#005979	\$ 59
Mobile Max PCMCIA 105 Mb HDD	#004801	\$342
PCMCIA 9624 Fax Modem	#001722	\$135
PCMCIA 14.4 Fax Modem	#001812	\$179
PCMCIA Ethernet Adapter	#001832	\$159



Elite 486SX SubNote

- Intel 486SX SL-Enhanced Processor
- 4 Mb RAM (expands to 12 Mb)
- 9.5" Mono or Dual-Scan VGA Display
- Turbo Bus Accelerated Video
- 3.5" External Disk Drive
- User Replaceable Hard Drive
- One Type II PCMCIA Slot
- Built-in Trackball
- NiMH Battery & AC Adapter
- Advanced Power Management with SMM
- One Parallel & One Serial Port
- External VGA & Keyboard Port
- MS-DOS 6.2
- Weight: 3.9 lbs.
- Carrying Case
- One Year Manufacturer's Warranty



Monochrome SubNote

- 486SX-25 with 260 Mb HDD**
#007342 **\$1299**
- 486SX-25 with 340 Mb HDD & PCMCIA 9624 S/R Fax Modem**
#007307 **\$1499**

Dual Scan Color SubNote

- 486SX-33 with 260 Mb HDD, WFW 3.11 & Lotus Organizer**
#007340 **\$1899**
- 486SX-33 with 340 Mb HDD, WFW 3.11 & Lotus Organizer**
#007341 **\$1999**
- 486SX-33 with 520 Mb HDD, 8 Mb of RAM, WFW 3.11, Lotus Organizer & PCMCIA 14.4 S/R Fax Modem**
#008007 **\$2499**

Options

4 Mb RAM Card	#005970	\$219
8 Mb RAM Card	#005971	\$469
Car Adapter	#005972	\$ 65
Mobile Max PCMCIA 105 Mb HDD	#004801	\$342
PCMCIA 9624 Fax Modem	#001722	\$135
PCMCIA 14.4 Fax Modem	#001812	\$179
PCMCIA Ethernet Adapter	#001832	\$159



Call or write for your Free MidWest Micro catalog.

MidWest Micro

6910 U.S. Route 36 East, Fletcher, Ohio 45326

1-800-682-7256

Fax: 1-800-562-6622

Monday-Friday: 9 a.m. to 7 p.m. Saturday: 10 a.m. to 4 p.m.



For your protection we check thoroughly for stolen credit cards

Technical Support:

1-800-262-6622

Customer Service:

1-800-728-8584

Dealers Call:

1-800-682-0522

AD#G09

Disclaimer: The Intel Inside Logo, Intel, Pentium and OverDrive are registered trademarks of the Intel Corporation. Seagate and the Seagate Logo are registered trademarks of Seagate Technology. The Energy Star emblem does not represent EPA endorsement of any product or service. All products are trademarks of their respective manufacturers. All registered and unregistered trademarks are the sole property of their respective companies.

Policy: No service charge for credit card orders. Prices are subject to change. Repair or replacement of defective products is at MidWest Micro's discretion. We are not responsible for errors in typography and photography. Original shipping and handling fees, as well as return shipping charges, are non-refundable. There are no returns for credit after 30 days. Call or write MidWest Micro for more information on warranties and policies.


```

@ECHO OFF
REM P1.BAT - Demonstrates that maximum length of a path is
REM 66 characters.
CD\
IF EXIST $ GOTO NotSafe
IF EXIST $ \NUL GOTO NotSafe
ECHO Working...
:Loop
MD $
CD $
REM If file FOO exists, then we were not able to
REM successfully create and switch to a subdirectory.
IF EXIST FOO GOTO Out
REM > FOO
GOTO Loop
:NotSafe
ECHO A file or directory named "$" exists in the root
ECHO directory. It is not safe to run this batch file.
GOTO Done
:Out
CLS
ECHO.
ECHO.
ECHO.
ECHO The current directory is as long as possible:
CD
ECHO          1          2          3          4          5          6
ECHO 123456789012345678901234567890123456789012345678901234567
ECHO.
ECHO Now cleaning up.
CD \
DELTREE /Y $
:Done

```



Figure 1: This batch file demonstrates that the longest directory path under DOS is 66 characters.

```

@ECHO OFF
REM P2.BAT - Expands the PATH to a full 127 characters, then
REM restores the original PATH.
IF NOT '%1'==' ' GOTO Rebuild
IF '%$%'==' ' GOTO Ok
ECHO The environment variable "$" is in use.
GOTO End
:Ok
REM Next line ends with 122 semicolons, but for reasons of space
REM the 122 semicolons are not shown here.
PATH=%path%;;;;;;...;;
PATH
ECHO          1          1          1
ECHO          9          0          1          2
ECHO 12345678901234567890123456789012345678901234567
PAUSE
%0 %path%

:Rebuild
PATH=%1
SHIFT
:Loop
IF '%1'==' ' GOTO Out
PATH=%path%;%1
SHIFT
GOTO Loop
:Out
ECHO Original path restored.
:End

```



Figure 2: This batch file attempts unsuccessfully to expand the path environment variable beyond the limit of 122 characters.

deletes it using DOS 6.0's DELTREE command.

The path that's created with the PATH command is limited to 122 characters. This limit comes about because the DOS command line can be no longer than 127 characters; subtract the 5 char-

acters "PATH=", and you're left with 122 characters. This limit has been the same since DOS 2.0 and didn't change in DOS 6.0.

The batch file P2.BAT (Figure 2) demonstrates this limit. It attempts to add 122 semicolons to the current path and

then shows that the resulting value plus "PATH=" is exactly 127 characters. A likely reason for an apparent lower limit is a batch file line that when all its variables are expanded is longer than the 127 character limit.

You can download both batch files from PC MagNet's Utilities/Tips Forum archived as P.ZIP.—*Neil J. Rubenking*

■ WORD PROCESSING

Printing WP 5.1 in Landscape

❓ After purchasing two Canon BJ-200 Bubble Jets, my company is unable to print out WordPerfect 5.1 for DOS files in landscape mode. We contacted WordPerfect Corp. but were told that there are no DOS drivers for the printer. Is there any way to solve our problem?

*Debbie Hinkle
Concord, North Carolina*

► **PC MAGAZINE:** The short answer to this question is that the Canon printers are doing just what they're supposed to do, and there aren't any drivers that will solve the problem. More precisely, the BJ-200s won't print in landscape mode simply because the printers themselves don't offer a landscape mode.

Despite its laser-like resolution, the BJ-200 has more in common with dot matrix printers than laser printers. Aside from the native Canon mode, the only emulations the printer offers are for the IBM Proprinter X24E and the Epson LQ-510—both dot matrix printers. And even the native mode has more in common with dot matrix command sets than with typical laser printer command sets. The standard way to print in landscape on a dot matrix printer is to rotate the page 90 degrees when you feed it into the printer.

Just because the printer doesn't offer landscape printing as a choice, however, doesn't mean you can't print in landscape. If physically rotating the paper is inconvenient, you can find software that will do the job for you. Canon recommends Bitstream's FaceLift for WordPerfect, which lets you print in landscape format simply by using the WordPerfect 5.1 Page Format menu to

Recordable CD-ROM!

Make your own CDs...
from multimedia/videos,
data archiving/backups to
recording your own audio
CD of custom tunes.



**"After only ten minutes with the
RCD-PC 2.0, I was hooked."**

-Tom Carlton, CD-ROM Professional, Jan. 1994



Publish Magazine
1993 Impact Award



Imaging Magazine
1994 Editors' Choice



PC Computing
1993 Multimedia
Product of the Year

Introducing the Pinnacle RCD-202™ PC, the best recordable CD-ROM system available for only \$2695 complete. The Pinnacle RCD is ideal for data archiving/backup, as well as testing and creating multimedia titles. You can even make your own music/audio CD. RCD media is very inexpensive, only \$39 per disk or 6 cents per megabyte. The RCD is the best way to archive data since RCD media can be played back on any standard CD-ROM drive.



The Pinnacle RCD-202 is a multisession recorder and player that supports ISO 9660, mixed mode, CD-XA, CD-I, Mac HFS and CD Red Book audio recording standards.

The RCD-202 system comes complete with Pinnacle's easy-to-use software program for Windows. Simply drag-and-drop files from file manager to your RCD-PC window and in minutes you've just mastered your own compact disk. Call: 800-553-7070

PINNACLE MICRO
THE OPTICAL STORAGE COMPANY™

International Tel. 714-727-3300 U.S. Fax 714-727-1913

All Trademarks and Registered Trademarks of Their Respective Owners

CIRCLE 098 ON READER SERVICE CARD



COMPUTER DISCOUNT WAREHOUSE™

WHY PAY RETAIL? CDW® Sells For Less!

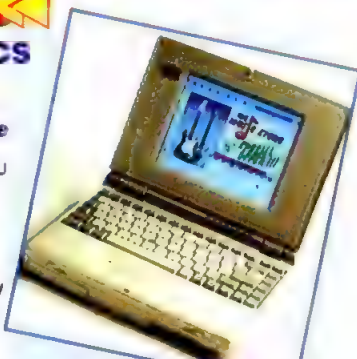
COMPUTER DISCOUNT WAREHOUSE

NEW!

Toshiba T2400CS and T2400CT

The ultimate 50MHz color notebook value

- ◆ 3.3 volt IntelDX2™ 50MHz CPU
- ◆ 4MB RAM std., 20MB max.
- ◆ 250MB or 320MB hard drive
- ◆ 9.5" dual-scan color display (T2400CS)
- ◆ 8.4" active matrix color display (T2400CT)
- ◆ Graphics accelerator with local bus video
- ◆ 1) 14.5mm Type III PCMCIA slot
- ◆ 1) Type II PCMCIA slot
- ◆ SCSI-2 interface
- ◆ Options: internal sound card, port replicator
- ◆ Keyboard-integrated AccuPoint™ pointing device
- ◆ NiMH battery, 2+ hours life
- ◆ Software: MS-DOS, Windows™ for Workgroups, SCSI, PCMCIA and Toshiba utilities
- ◆ Weighs only 6.5 lbs.
- ◆ 3 year warranty



TOSHIBA

T2400CS, 250MB hard drive	\$2877.59	CDW 43341
T2400CT, 250MB hard drive	\$3597.75	CDW 43342
T2400CT, 320MB hard drive	\$3799.16	CDW 43343

T4800CT 75MHz Color Notebook

Unsurpassed performance and superior multimedia capabilities

- ◆ SL-enhanced IntelDX4™ 75MHz CPU, 16KB cache
- ◆ 8MB RAM std., 24MB Max
- ◆ 500MB hard drive
- ◆ 9.5" active matrix TFT-LCD color display
- ◆ Integrated 16-bit audio, built-in microphone and speaker
- ◆ 2 PCMCIA slots: Type II and Type III
- ◆ Serial, parallel, keyboard mouse audio, CRT and expansion bus ports
- ◆ Advanced NiMH battery: 2+ hours
- ◆ Pre-installed MS-DOS®, Windows™ for Workgroups
- ◆ 3 year warranty



ONLY!

\$5487.47 CDW 39099

Toshiba T3600CT 50MHz performance, subnotebook portability

- ◆ 3.3 volt IntelDX2™ 50MHz CPU
- ◆ 4MB RAM std., 20MB max.
- ◆ 250MB hard drive
- ◆ 8.4" active matrix color display
- ◆ 1) Type II PCMCIA slot
- ◆ Keyboard-integrated AccuPoint™ pointing device
- ◆ Standard external floppy drive
- ◆ 3 year warranty



\$3997.39 CDW 43339

NEW!

Toshiba T1960CS and T1960CT

Fast and affordable Toshiba quality

- ◆ 3.3 volt IntelDX2™ 50MHz CPU
- ◆ 4MB RAM std., 20MB max.
- ◆ 200MB or 320MB hard drive
- ◆ 9.5" dual-scan color display (T1960CS)
- ◆ 8.4" active matrix color display (T1960CT)
- ◆ 1) 14.5mm Type III PCMCIA slot
- ◆ BallPoint mouse with QuickPort
- ◆ 3 year warranty



TOSHIBA

T1960CS 200MB hard drive	\$2347.57	CDW 42627
T1960CT 200MB hard drive	\$2996.96	CDW 42628
T1960CT 320MB hard drive	\$3289.91	CDW 42629

TOP SELLER

T4700CS and T4700CT

Uncompromised performance, flexibility and expandability

- ◆ SL-enhanced IntelDX2™ 50MHz CPU
- ◆ 8MB RAM std., 24MB max.
- ◆ 200MB or 320MB hard drive
- ◆ Choice of displays: 9.5" dual-scan color (T4700CS) 9.5" active matrix color (T4700CT)
- ◆ Integrated 16-bit audio and microphone
- ◆ PCMCIA slots: 1) Type II and 1) Type III (16mm)
- ◆ BallPoint mouse with QuickPort
- ◆ Ports: serial, parallel, mouse and keyboard, audio, expansion bus, CRT
- ◆ NiMH battery, 2+ hours life
- ◆ Pre-loaded MS-DOS® and Windows™
- ◆ 3 Year Warranty



TOSHIBA

T4700CS, 200MB	\$3097.76	CDW 33645
T4700CS, 320MB	\$3347.56	CDW 33646
T4700CT, 200MB	\$4437.50	CDW 33642
T4700CT, 320MB	\$4767.08	CDW 33644

If You Find a Better Price, Call CDW Before You Buy!

CDW® Sells for Less and Services You Better!

(800) 998-4CDW

PCM1031

©1994 CDW Computer Centers Inc.

MOST ORDERS SHIP THE SAME DAY



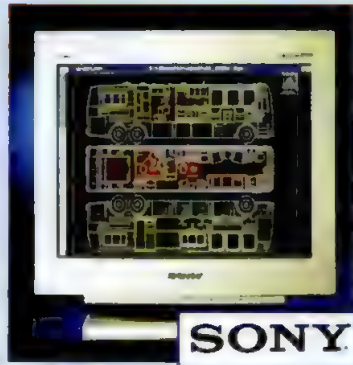
COMPUTER DISCOUNT WAREHOUSE™

WHY PAY RETAIL? CDW® Sells For Less!

BIG TIME SAVINGS ON NAME BRAND BIG SCREEN MONITORS

SONY GDM- 20se1 20" Multiscan Trinitron Graphic Display

- 20" Trinitron CRT, 19.1" maximum viewable area
- .30mm aperture grille pitch
- 31.5 to 85kHz horizontal scan range
- 50 to 150Hz vertical scan range
- Full digital control
- Refresh up to 76Hz @ 1280x1024
- Max Res 1600 X 1200 @ 60Hz
- EPA Energy Star compliance
- Color temp control
- 3 years parts and labor and 2 years CRT warranty



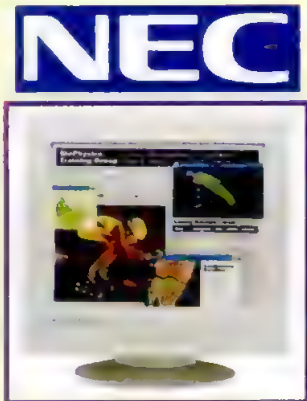
SONY

ONLY!

\$1895.00 CDW 44228

NEC 6FGp™

- 21" flat square display
- .28mm dot pitch
- 1280x1024 maximum resolution
- MPRII II compliant
- AccuColor control system
- Digital controls
- OptiClear surface
- Manual degauss
- Anti-static screen
- Dual dynamic beam focus
- XGA-2 compatibility
- Invar shadow mask
- Convenient up front controls
- 3 year warranty



ONLY!

\$1997.00 CDW 32665



MX21F Multi-Frequency Monitor

- ✓ 21" flat square CRT
- ✓ .28mm dot pitch
- ✓ Semi-tinted OCLI anti-reflection coating
- ✓ Max. resolution 1600 X 1280 non-interlaced
- ✓ Up to 135Hz vertical refresh
- ✓ Up-front digital controls
- ✓ Removable 4-way tilt & swivel base
- ✓ MPRII compliant, "Green Energy" technology
- ✓ 2 year warranty on CRT, 1 year labor

ONLY!

\$1838.29 CDW 31097



MAGNAVOK

**Lowest
Cost
20"**

Magnavox 20CM64

- 20" display
- Maximum display resolution 1280x1024 Non-interlaced
- .31mm dot pitch
- Autoscans capability to support VGA, Super VGA, VESA 56/60/72 Hz, 8514/A, XGA, MAC II and more
- Horizontal scan from 30 to 64KHz
- Vertical scan from 50 to 90Hz
- Front mounted controls
- Tilt/swivel base
- Analog VGA cable and Macintosh II (15 Pin Standard "D") Adapter
- 1 year warranty

ONLY!

\$999.90 CDW 20751

**GET DOWN TO
BUSINESS WITH
CDW'S LOW PRICES**

CDW® Sells for Less and Services You Better!

(800) 998-4CDW

PC/M/386

CDW 31097 Computer Center, Inc.

**See our line list for
complete selection of
name brand monitors.**

COMPUTER DISCOUNT WAREHOUSE™



COMPUTER DISCOUNT WAREHOUSE

Canon

Innova i486SX/33 Desktop Computer

- ◆ Intel 486SX/33 CPU ◆ 4MB RAM std., 68MB max. ◆ 340MB hard drive ◆ VESA local bus video ◆ Preinstalled MS-DOS and Windows ◆ Energy Star certified ◆ Internal 2400/9600 data/fax modem ◆ One-year on-site warranty

ONLY! \$899.50 CDW 42897
monitor sold separately

True Value



WHY PAY RETAIL?

CDW Sells For Less

True 720dpi



EPSON

Stylus Color 720 dpi Color Ink Jet Printer

Laser-quality color ink jet printing is now a reality with the stunning 720 dpi/48 nozzle output

of the Stylus Color. Epson MicroWeave technology ensures smooth color blends, and ESC/P2 emulation provides compatibility with popular applications.

CDW price \$559.70 CDW 40804

HARDWARE, SOFTWARE & PERIPHERALS AT DISCOUNT PRICES

NETWORKING PRODUCTS

NOVELL

5 User CD	778.57
10 User CD	1788.90
25 User CD	2584.41
50 User	3461.67

Network V3.12

5 User 3.5"	577.73
10 User 3.5"	1297.55
25 User 3.5"	1898.00
50 User 3.5"	2578.00
100 User 3.5"	3498.00

Call for Pricing on NetWare CD-ROM Versions and Upgrades

PERSONAL NETWARE V1.0 NEW

1 User	59.88
5 User	259.52

NOVELL PRICING IS SUBJECT TO CHANGE. PLEASE CALL CDW FOR THE MOST CURRENT PRICING

TECHNICAL SUPPORT

TC5143 Ethernet coax.	116.47
TC5143 Ethernet 8pk	697.25
TC5143 Ethernet 10BT	99.95
TC5143 Ethernet 10BT 8pk	469.88
TC6242 ARCNET 8-bit coax	66.86
TC6242 ARCNET 1P	179.99
TC6242 ARCNET 1P 8pk	95.84
TC6040 ARCNET passive 4 port hub coax	30.50
TC5055 Ethernet 8 port hub 10BT	336.47
TC4045 Token Ring 16/4	309.33

CDW Carries the Complete Line of TCS Products. Call for Details!

ARTISOFT

NodeRunner 2000A	215.50
NodeRunner 2000T	169.00
NodeRunner 2000C	169.00
NodeRunner/SI 2000A	93.50
NodeRunner/SI 2000T	78.50
NodeRunner/SI 2000C	76.70
LANtastic V6.0	79.50
LANtastic V6.0 5 User	322.90
LANtastic V6.0 Starter Kit	243.79
Central Station II	389.13
10BT 5 port internal hub	256.72
NodeRunner starter kit WIN	479.29
Simply LANtastic starter kit	163.79
Simply LANtastic V1.0	47.99
T-Runner 8 port 10BT	283.92
T-Runner 12 port 10BT	488.81

SMC

Ultra16 ETHERNET COAX	105.25
Ultra16 COAX 6PK	579.73
Ultra16 COAX 24PK	2206.46
Ultra16 THE RINE 10BT	179.25
Ultra16 10BT 6PK	541.20
Ultra16 10BT 24PK	1799.25
Ultra16 THE RINE COMBO	179.25
Ultra16 COMBO 6PK	541.20
Ultra16 COMBO 24PK	2206.46
Elite and ELITE COAX 6PK	189.26
Elite and ELITE MCA COAX	179.25
Elite and ELITE 10BT 6PK	541.20
Elite and ELITE MCA 10BT	179.25
EliteCard ELITE EISA 10BT	579.73
EliteCard ELITE COMBO	179.25
EliteCard ELITE COAX 6PK	189.26
EliteCard ELITE MCA 10BT	179.25
EliteCard ELITE EISA 10BT	579.73
EliteCard ELITE COMBO	179.25
EliteCard ELITE COAX 6PK	189.26
EliteCard ELITE MCA 10BT	179.25
EliteCard ELITE EISA 10BT	579.73
EliteCard ELITE COMBO	179.25
EliteCard ELITE COAX 6PK	189.26
EliteCard ELITE MCA 10BT	179.25
EliteCard ELITE EISA 10BT	579.73
EliteCard ELITE COMBO	179.25
EliteCard ELITE COAX 6PK	189.26
EliteCard ELITE MCA 10BT	179.25
EliteCard ELITE EISA 10BT	579.73
EliteCard ELITE COMBO	179.25

3Com

3C503 Etherlink II coax	158.44
3C509 Etherlink III coax	115.50
3C509 Etherlink III coax 5pk	489.02
3C509 Etherlink III 10BT	115.50
3C509 Etherlink III 10BT 5pk	442.36
3C509 Etherlink III combo	132.73
3C509 Etherlink III combo 5pk	532.84
3C579 Etherlink EISA coax	229.91
3C579 Etherlink EISA 10BT	229.91
3C1827 12 port Linkbuilder 10BT	638.95

NETWORKING PRODUCTS

OTHER TOP-QUALITY NAME BRANDS

Eagle NE2000+ coax	81.32
Eagle NE2000+ 10BT	77.31
Eagle NE2000 coax w/TPA	629.81
National Semi NE2000+ coax	76.16
National Semi NE2000+ 10BT	69.08

If You Don't See What You Are Looking For, Call CDW Carries the Best Networking Selection in the Industry!

Xircor

PE310BC pocket Ethernet coax	309.80
PE310B2 pocket Ethernet coax	267.80
PE310B1 pocket Ethernet 10BT	268.31
PA202B5 pocket ARCNET coax	229.30
Pocket Token Ring III	455.89
PPX03 Parallel port multiplexor	77.80
14.4Kbps packet modem	468.74

IBM TOKEN RING

IBM Token Ring 16/4 ISA	423.03
IBM Token Ring 16/4 MCA	446.55
IBM Token Ring MAU	458.89

intel

EtherExpress PRO Flash 10BT	115.07
EtherExpress PRO Flash 10BT 5pk	482.72
EtherExpress PRO Flash 10BT 20pk	1489.89
EtherExpress PRO Flash combo	115.07
EtherExpress PRO Flash combo 5pk	505.88
EtherExpress PRO Flash combo 20pk	1827.22
EtherExpress 16 coax	99.33
EtherExpress 16 coax 5pk	454.13
EtherExpress 16 coax 20pk	1698.38
EtherExpress MCA coax	166.52
EtherExpress MCA 10BT	2036.83
EtherExpress 16 10BT 5pk	454.13
EtherExpress 16 10BT 20pk	1698.38
EtherExpress MCA 10BT	2036.83
EtherExpress Flash 10BT	111.88
EtherExpress Flash 10BT 5pk	549.72
EtherExpress Flash 10BT 20pk	179.79
EtherExpress Flash combo 5pk	613.55
EtherExpress EISA hub	400.88
EtherExpress ISA hub	349.84
NetPortExpress II COAX	387.07
NetPortExpress II 10BT	368.85
EtherExpress ISA hub	343.45
EtherExpress ISA hub exp	321.99

TAPE, REMOVABLE & FLOPPY DRIVES

COLORADO MEMORY SYSTEMS INC.

Jumbo 120MB internal	99.80
Jumbo 250MB internal	174.34
Trakker 100MB parallel port	209.90
Trakker 250MB parallel port	344.40
PowerTape 2 4GB SCSI internal	937.58
PowerTape 2 4GB SCSI external	1077.79
PowerDAT 4GB SCSI internal	1127.79

MEGA

Tape 250MB internal	169.57
Optical 21MB internal	379.27
Bernoulli 30MB PC Powered Pro	298.49
Bernoulli 150MB internal SCSI	479.11
Bernoulli 150MB internal IDE	469.59
Bernoulli 150MB PC Powered	458.76
Bernoulli 150MB Transportable	568.78
90MB cartridge	89.27
150MB cartridge	92.80

MICROSOLUTIONS

Backup 3.5" 1.44MB floppy parallel	153.40
Backup 5.25" 1.2MB floppy parallel	165.38
Backup 340MB HD parallel	439.75
Backup 2X CD-ROM parallel	377.84
Backup 250MB tape backup parallel	355.05

Sydes

Pro Note 42MB parallel	289.77
Puma 68MB parallel	442.44
88MB w/16-bit adapter external	538.81
Puma 105MB parallel	389.87
Mavin 105MB IDE internal	378.40

TAPE, REMOVABLE & FLOPPY DRIVES

Mountain

TD-250 250MB IDE internal	189.39
F58500 305MB IDE internal	449.50
SideCar II 305MB parallel	358.77
1200-4 4GB SCSI external	2045.39
750MB-1 5GB widestrip external	1254.99

WYSE TERMINALS

Wyse 30 amber or green	272.89
Wyse 55 amber/green/white	223.21
Wyse 55 amber/green/white	229.83
Wyse 60 amber/green/white	278.60
Wyse 150 amber/green/white	265.45
Wyse 160 amber/green/white	329.84
Wyse 325 color	427.40

MULTIMEDIA, SOUND, CD

Altec Lansing ACS300 speakers/subwoofer	239.69
Creative Labs Discovery 16 internal	328.86
Creative Labs SoundBlaster 16 AWE32	289.22
Creative Labs SoundBlaster Pro value edition	82.45
Creative Labs SoundBlaster 16 SCSI-2	148.09
Creative Labs SoundBlaster 16 ASP MCD	175.67
Creative Labs Multimedia Office	573.40
Diamond Sonic Sound basic	224.58
Diamond Sonic Sound LX	109.30
Media Magic 2X CD-ROM Kit internal	149.89
Media Magic DSP-16 System internal	312.26
Media Magic ISP-16 System internal	294.10
Media Magic ISP-16 Sound Board	76.45
Microsoft Bookshelf 1994 CD	65.79
Microsoft Encarta 1994	62.08
Microsoft Windows Sound System	52.95
Microsoft Encarta 1994	65.24
Microsoft Multimedia Beethoven	52.86
Orchid GameWave 32	108.87
Orchid GameWave 32	108.87
Orchid SoundWave 32 SCSI	194.82
Orchid SoundWave 32 SCSI	291.30
Orchid SoundWave 32 SCSI	291.30
Turtle Beach Monterey sound card	349.77
Video Logic 928Movie VLB 1MB	301.73

CD-ROM & OPTICAL DRIVES

Chicon CD-555 CD-ROM kit internal	319.79
Chicon CD-555 CD-ROM kit external	415.79
Mitsumi FX-001D 2X kit internal	148.40
NEC 33x internal	430.37
NEC 33x portable	469.52
NEC 33x portable	399.19
NEC 4X Pro	899.00
Orchid SoundWave/CD multimedia kit	355.52
Pioneer DR-M604X Quadraspin 6 disc	1088.34
Plexstor 3028 240MS kit internal	309.42
Plexstor 3028 240MS kit external	418.27
Sony CDU-33A 2X CD-ROM internal	133.46
Sony CDU-535 CD-ROM internal	274.72
Sony CDU-555 220mb internal SCSI	219.64
Sony CDU-720S1 CD-ROM internal	449.88
Sydes Parallel Port CD-ROM	289.48
Toshiba 3401 SCSI CD-ROM external	403.87
Toshiba 3401 SCSI CD-ROM kit external	541.38
Toshiba 3401 SCSI CD-ROM internal	292.17

PLOTTERS, DIGITIZERS & SCANNERS

XGT 12X12 serial and ADB	213.98
XLP 12 X 18 16 button	438.93
DB III 12X12 4 button	248.90
DB III 12X12 16 button	248.90
DB III 12X18 pressure pen	399.85
DB III 12X18 16 button cordless	695.85
SLATE 12X12 pressure pen	363.40
SLATE 12X12 16 button	239.91

PLOTTERS, DIGITIZERS & SCANNERS

Canon

DX4015 color scanner	887.48
----------------------	--------

Summagraphics

Summagraphics III 12 X 12 16 button	253.90
Summagraphics III 18 X 12 4 button	524.44

HOUSTON INSTRUMENT

HI 7100 A-D size 8 pin	2586.78
HI 7200 A-F size 8 pin	3387.22

HEWLETT PACKARD

ScanJet IIP	609.09
ScanJet IIP document feeder	289.83
ScanJet IICX W/ISA interface	995.50
ScanJet IICX document feeder	474.72
ScanJet IICX transparency adapter	633.26

EPSON

ActionScanner ES600C	694.25
ActionScanner ES800C	1032.87
ActionScanner ES800C PRO	1234.42

VIDEO PRODUCTS

VGA & SUPER VGA MONITORS

Mag Innovation MX15F	479.88
Mag Innovation MX15F	382.31
Mag Innovation MX17F	809.79
Mag Innovation MX17FB	839.14
Mag Innovation DX17F	698.00
Magnavox CM2089 14" 28	243.20
Magnavox CM2089 14" 28 NI	264.00
Magnavox CM4015 15"	359.85
Magnavox CM4017 17"	648.20
Magnavox 20CM84 20" SPECIAL!	999.00
Nanaco F340W 15"	658.00
Nanaco F550W 17"	1013.91
NEC 2V 14" **	314.50
NEC 3V 15" **	427.49
NEC 3FGE 15"	557.17
NEC 4FGE 15"	617.18
NEC 5FGE 17"	998.50
NEC 5FGE 17"	1097.21
NEC 6FGE 21"	1997.00

** after \$25,540 manufacturer rebate (ends 9/30/94)

Philips Brilliance 17"	959.33
Philips Brilliance 21"	2239.45
Sony 155F 15"	447.92
Sony CPD1730 17"	947.73
Sony 17SE 17"	968.88

VGA & SUPER VGA DISPLAY CARDS

AOS VGA to TV Elm	224.57
ATI Graphics Ultra+ 2MB	205.33
ATI Graphics Ultra Pro 2MB	344.22
ATI Graphics Ultra Pro 2MB EISA	314.85
ATI Graphics Ultra Pro 2MB VLB	384.25
Creative Labs Video Spigot	227.73
Diamond Stealth 32 VLB 2MB	178.06
Diamond SpeedStar 64 ISA 1MB	185.85
Diamond SpeedStar Pro 1MB	114.86
Diamond Viper VLB 2MB	337.86
Herzules Dynamic Pro VLB	114.23
Herzules Graphics Power ISA 1MB	213.67
Herzules Graphics Power ISA 2MB	308.97
Intel Smart Video Recorder	349.80
Orchid Kelvin 64 ISA 1MB	147.10
Orchid Kelvin 64 ISA 2MB	196.97
Orchid Kelvin 64 VLB 1MB	148.83
Orchid Kelvin 64 VLB 2MB	194.19

COMPUTER DISCOUNT WAREHOUSE

If You Find a Better Price, Call CDW Before You Buy (800) 999-4CDW

NASDAQ
BUY WITH CONFIDENCE
CDW IS A NASDAQ TRADED COMPANY

No Surcharge For Credit Cards
VISA
MasterCard
Discover
American Express

CDW HOURS
Mon-Fri 9:00-6:00 CDT
Sat 9:00-5:00 CDT
Sun 9:00-6:00 CDT
Kiosk Support for Customers
800-999-4CDW

MOST ORDERS SHIP THE SAME DAY

COMPUTER DISCOUNT WAREHOUSE

CDW

intel

14.4K Faxmodems

Our lowest price ever on Intel 14.4K modems!

- ✓ V.32bis (14.4K bps) data, 14.4K bps fax ✓ V.42 error correction, V.42bis data compression
- ✓ Includes Dairina WinFax Lite ✓ Over \$100 in free online service offers ✓ 5 year warranty

14.4K internal **\$79.00** CDW 32399
14.4K external **\$109.00** CDW 32400

HURRY! Supplies are limited

WHY SETTLE FOR LESS?

CDW SERVICES YOU BETTER

Robotics

Sportster V.34

Sportster reliability, economy and performance!

- ✓ True V.34 transmit data twice as fast as 14,400 bps modems ✓ High-speed protocols V.34 (28.8K bps), V.34bis (28.8K bps), V.34bis (14.4K bps) ✓ V.42/MNP 2-4 error correction, V.42bis data compression ✓ LED status lights, external volume control ✓ Includes QuickLink II software ✓ FREE! over \$300 in online service offers ✓ 5 year warranty, made in USA

V.34 internal w/fax **CALL**
V.34 external w/fax **CALL**

CDW CARRIES OVER 15,000 PRODUCTS. IF YOU DON'T SEE IT, CALL!

COMPUTERS	
TOSHIBA	
T1910 200MB	1487.18
T1910C 200MB	1487.18
T1910C 400MB	1487.18
T1910C 600MB	1487.18
T1910C 800MB	1487.18
T1910C 1000MB	1487.18
T1910C 1200MB	1487.18
T1910C 1400MB	1487.18
T1910C 1600MB	1487.18
T1910C 1800MB	1487.18
T1910C 2000MB	1487.18
T1910C 2200MB	1487.18
T1910C 2400MB	1487.18
T1910C 2600MB	1487.18
T1910C 2800MB	1487.18
T1910C 3000MB	1487.18
T1910C 3200MB	1487.18
T1910C 3400MB	1487.18
T1910C 3600MB	1487.18
T1910C 3800MB	1487.18
T1910C 4000MB	1487.18
T1910C 4200MB	1487.18
T1910C 4400MB	1487.18
T1910C 4600MB	1487.18
T1910C 4800MB	1487.18
T1910C 5000MB	1487.18
T1910C 5200MB	1487.18
T1910C 5400MB	1487.18
T1910C 5600MB	1487.18
T1910C 5800MB	1487.18
T1910C 6000MB	1487.18
T1910C 6200MB	1487.18
T1910C 6400MB	1487.18
T1910C 6600MB	1487.18
T1910C 6800MB	1487.18
T1910C 7000MB	1487.18
T1910C 7200MB	1487.18
T1910C 7400MB	1487.18
T1910C 7600MB	1487.18
T1910C 7800MB	1487.18
T1910C 8000MB	1487.18
T1910C 8200MB	1487.18
T1910C 8400MB	1487.18
T1910C 8600MB	1487.18
T1910C 8800MB	1487.18
T1910C 9000MB	1487.18
T1910C 9200MB	1487.18
T1910C 9400MB	1487.18
T1910C 9600MB	1487.18
T1910C 9800MB	1487.18
T1910C 10000MB	1487.18
T1910C 10200MB	1487.18
T1910C 10400MB	1487.18
T1910C 10600MB	1487.18
T1910C 10800MB	1487.18
T1910C 11000MB	1487.18
T1910C 11200MB	1487.18
T1910C 11400MB	1487.18
T1910C 11600MB	1487.18
T1910C 11800MB	1487.18
T1910C 12000MB	1487.18
T1910C 12200MB	1487.18
T1910C 12400MB	1487.18
T1910C 12600MB	1487.18
T1910C 12800MB	1487.18
T1910C 13000MB	1487.18
T1910C 13200MB	1487.18
T1910C 13400MB	1487.18
T1910C 13600MB	1487.18
T1910C 13800MB	1487.18
T1910C 14000MB	1487.18
T1910C 14200MB	1487.18
T1910C 14400MB	1487.18
T1910C 14600MB	1487.18
T1910C 14800MB	1487.18
T1910C 15000MB	1487.18
T1910C 15200MB	1487.18
T1910C 15400MB	1487.18
T1910C 15600MB	1487.18
T1910C 15800MB	1487.18
T1910C 16000MB	1487.18
T1910C 16200MB	1487.18
T1910C 16400MB	1487.18
T1910C 16600MB	1487.18
T1910C 16800MB	1487.18
T1910C 17000MB	1487.18
T1910C 17200MB	1487.18
T1910C 17400MB	1487.18
T1910C 17600MB	1487.18
T1910C 17800MB	1487.18
T1910C 18000MB	1487.18
T1910C 18200MB	1487.18
T1910C 18400MB	1487.18
T1910C 18600MB	1487.18
T1910C 18800MB	1487.18
T1910C 19000MB	1487.18
T1910C 19200MB	1487.18
T1910C 19400MB	1487.18
T1910C 19600MB	1487.18
T1910C 19800MB	1487.18
T1910C 20000MB	1487.18
T1910C 20200MB	1487.18
T1910C 20400MB	1487.18
T1910C 20600MB	1487.18
T1910C 20800MB	1487.18
T1910C 21000MB	1487.18
T1910C 21200MB	1487.18
T1910C 21400MB	1487.18
T1910C 21600MB	1487.18
T1910C 21800MB	1487.18
T1910C 22000MB	1487.18
T1910C 22200MB	1487.18
T1910C 22400MB	1487.18
T1910C 22600MB	1487.18
T1910C 22800MB	1487.18
T1910C 23000MB	1487.18
T1910C 23200MB	1487.18
T1910C 23400MB	1487.18
T1910C 23600MB	1487.18
T1910C 23800MB	1487.18
T1910C 24000MB	1487.18
T1910C 24200MB	1487.18
T1910C 24400MB	1487.18
T1910C 24600MB	1487.18
T1910C 24800MB	1487.18
T1910C 25000MB	1487.18
T1910C 25200MB	1487.18
T1910C 25400MB	1487.18
T1910C 25600MB	1487.18
T1910C 25800MB	1487.18
T1910C 26000MB	1487.18
T1910C 26200MB	1487.18
T1910C 26400MB	1487.18
T1910C 26600MB	1487.18
T1910C 26800MB	1487.18
T1910C 27000MB	1487.18
T1910C 27200MB	1487.18
T1910C 27400MB	1487.18
T1910C 27600MB	1487.18
T1910C 27800MB	1487.18
T1910C 28000MB	1487.18
T1910C 28200MB	1487.18
T1910C 28400MB	1487.18
T1910C 28600MB	1487.18
T1910C 28800MB	1487.18
T1910C 29000MB	1487.18
T1910C 29200MB	1487.18
T1910C 29400MB	1487.18
T1910C 29600MB	1487.18
T1910C 29800MB	1487.18
T1910C 30000MB	1487.18
T1910C 30200MB	1487.18
T1910C 30400MB	1487.18
T1910C 30600MB	1487.18
T1910C 30800MB	1487.18
T1910C 31000MB	1487.18
T1910C 31200MB	1487.18
T1910C 31400MB	1487.18
T1910C 31600MB	1487.18
T1910C 31800MB	1487.18
T1910C 32000MB	1487.18
T1910C 32200MB	1487.18
T1910C 32400MB	1487.18
T1910C 32600MB	1487.18
T1910C 32800MB	1487.18
T1910C 33000MB	1487.18
T1910C 33200MB	1487.18
T1910C 33400MB	1487.18
T1910C 33600MB	1487.18
T1910C 33800MB	1487.18
T1910C 34000MB	1487.18
T1910C 34200MB	1487.18
T1910C 34400MB	1487.18
T1910C 34600MB	1487.18
T1910C 34800MB	1487.18
T1910C 35000MB	1487.18
T1910C 35200MB	1487.18
T1910C 35400MB	1487.18
T1910C 35600MB	1487.18
T1910C 35800MB	1487.18
T1910C 36000MB	1487.18
T1910C 36200MB	1487.18
T1910C 36400MB	1487.18
T1910C 36600MB	1487.18
T1910C 36800MB	1487.18
T1910C 37000MB	1487.18
T1910C 37200MB	1487.18
T1910C 37400MB	1487.18
T1910C 37600MB	1487.18
T1910C 37800MB	1487.18
T1910C 38000MB	1487.18
T1910C 38200MB	1487.18
T1910C 38400MB	1487.18
T1910C 38600MB	1487.18
T1910C 38800MB	1487.18
T1910C 39000MB	1487.18
T1910C 39200MB	1487.18
T1910C 39400MB	1487.18
T1910C 39600MB	1487.18
T1910C 39800MB	1487.18
T1910C 40000MB	1487.18
T1910C 40200MB	1487.18
T1910C 40400MB	1487.18
T1910C 40600MB	1487.18
T1910C 40800MB	1487.18
T1910C 41000MB	1487.18
T1910C 41200MB	1487.18
T1910C 41400MB	1487.18
T1910C 41600MB	1487.18
T1910C 41800MB	1487.18
T1910C 42000MB	1487.18
T1910C 42200MB	1487.18
T1910C 42400MB	1487.18
T1910C 42600MB	1487.18
T1910C 42800MB	1487.18
T1910C 43000MB	1487.18
T1910C 43200MB	1487.18
T1910C 43400MB	1487.18
T1910C 43600MB	1487.18
T1910C 43800MB	1487.18
T1910C 44000MB	1487.18
T1910C 44200MB	1487.18
T1910C 44400MB	1487.18
T1910C 44600MB	1487.18
T1910C 44800MB	1487.18
T1910C 45000MB	1487.18
T1910C 45200MB	1487.18
T1910C 45400MB	1487.18
T1910C 45600MB	1487.18
T1910C 45800MB	1487.18
T1910C 46000MB	1487.18
T1910C 46200MB	1487.18
T1910C 46400MB	1487.18
T1910C 46600MB	1487.18
T1910C 46800MB	1487.18
T1910C 47000MB	1487.18
T1910C 47200MB	1487.18
T1910C 47400MB	1487.18
T1910C 47600MB	1487.18
T1910C 47800MB	1487.18
T1910C 48000MB	1487.18
T1910C 48200MB	1487.18
T1910C 48400MB	1487.18
T1910C 48600MB	1487.18
T1910C 48800MB	1487.18
T1910C 49000MB	1487.18
T1910C 49200MB	1487.18
T1910C 49400MB	1487.18
T1910C 49600MB	1487.18
T1910C 49800MB	1487.18
T1910C 50000MB	1487.18
T1910C 50200MB	1487.18
T1910C 50400MB	1487.18
T1910C 50600MB	1487.18
T1910C 50800MB	1487.18
T1910C 51000MB	1487.18
T1910C 51200MB	1487.18
T1910C 51400MB	1487.18
T1910C 51600MB	1487.18
T1910C 51800MB	1487.18
T1910C 52000MB	1487.18
T1910C 52200MB	1487.18
T1910C 52400MB	1487.18
T1910C 52600MB	1487.18
T1910C 52800MB	1487.18
T1910C 53000MB	1487.18
T1910C 53200MB	1487.18
T1910C 53400MB	1487.18
T1910C 53600MB	1487.18
T1910C 53800MB	1487.18
T1910C 54000MB	1487.18
T1910C 54200MB	1487.18
T1910C 54400MB	1487.18
T1910C 54600MB	1487.18
T1910C 54800MB	1487.18
T1910C 55000MB	1487.18
T1910C 55200MB	1487.18
T1910C 55400MB	1487.18
T1910C 55600MB	1487.18
T1910C 55800MB	1487.18
T1910C 56000MB	1487.18
T1910C 56200MB	1487.18
T1910C 56400MB	1487.18
T1910C 56600MB	1487.18
T1910C 56800MB	1487.18
T1910C 57000MB	1487.18
T1910C 57200MB	1487.18
T1910C 57400MB	1487.18
T1910C 57600MB	1487.18
T1910C 57800MB	1487.18
T1910C 58000MB	1487.18
T1910C 58200MB	1487.18
T1910C 58400MB	1487.18
T1910C 58600MB	1487.18
T1910C 58800MB	1487.18
T1910C 59000MB	1487.18
T1910C 59200MB	1487.18
T1910C 59400MB	1487.18
T1910C 59600MB	1487.18
T1910C 59800MB	1487.18
T1910C 60000MB	1487.18
T1910C 60200MB	1487.18
T1910C 60400MB	1487.18
T1910C 60600MB	1487.18
T1910C 60800MB	1487.18
T1910C 61000MB	1487.18
T1910C 61200MB	1487.18
T1910C 61400MB	1487.18
T1910C 61600MB	1487.18
T1910C 61800MB	1487.18
T1910C 62000MB	1487.18
T1910C 62200MB	1487.18
T1910C 62400MB	1487.18
T1910C 62600MB	1487.18
T1910C 62800MB	1487.18
T1910C 63000MB	1487.18
T1910C 63200MB	1487.18
T1910C 63400MB	1487.18
T1910C 63600MB	1487.18
T1910C 63800MB	1487.18
T1910C 64000MB	1487.18
T1910C 64200MB	1487.18
T1910C 64400MB	1487.18
T1910C 64600MB	1487.18
T1910C 64800MB	1487.18
T1910C 65000MB	1487.18
T1910C 65200MB	1487.18
T1910C 65400MB	1487.18
T1910C 65600MB	1487.18
T1910C 65800MB	1487.18
T1910C 66000MB	1487.18
T1910C 66200MB	1487.18
T1910C 66400MB	1487.18
T1910C 66600MB	1487.18
T1910C 66800MB	1487.18
T1910C 67000MB	1487.18
T1910C 67200MB	1487.18
T1910C 67400MB	1487.18
T1910C 67600MB	1487.18
T1910C 67800MB	1487.18
T1910C 68000MB	1487.18
T1910C 68200MB	1487.18
T1910C 68400MB	1487.18
T1910C 68600MB	1487.18
T1910C 68800MB	1487.18
T1910C 69000MB	1487.18
T1910C 69200MB	1487.18
T1910C 69400MB	1487.18
T1910C 69600MB	1487.18
T1910C 69800MB	1487.18
T1910C 70000MB	1487.18
T1910C 70200MB	1487.18
T1910C 70400MB	1487.18
T1910C 70600MB	1487.18
T1910C 70800MB	1487.18
T1910C 71000MB	1487.18
T1910C 71200MB	1487.18
T1910C 71400MB	1487.18
T1910C 71600MB	1487.18
T1910C 71800MB	1487.18
T1910C 72000MB	1487.18
T1910C 72200MB	1487.18
T1910C 72400MB	1487.18
T1910C 72600MB	1487.18
T1910C 72800MB	1487.18
T1910C 73000MB	1487.18
T1910C 73200MB	1487.18
T1910C 73400MB	1487.18
T1910C 73600MB	1487.18
T1910C 73800MB	1487.18
T1910C 74000MB	1487.18
T1910C 74200MB	1487.18
T1910C 74400MB	1487.18
T1910C 74600MB	1487.18
T1910C 74800MB	1487.18
T1910C 75000MB	1487.18

specify landscape for the page size and font-type settings.

To set WordPerfect to landscape format, press Shift-F8 and choose Page and then Paper Size/Type. If you've already defined a landscape format, highlight it and choose Edit. Make sure the paper size is set appropriately—a width of 11 inches by a height of 8 inches for letter-size paper—and the Font Type is set to Landscape. If you haven't defined a landscape format, choose Add. Next, choose a Paper Type and a Paper Size, specify the size you want to use (typically Standard Landscape), and make sure Font Type is set to Landscape.

Once you've confirmed or defined the format definition, press F7 three times to return to the editing screen and set WordPerfect to use the landscape page definition. Note that if you define a new format using the same name for Paper Type as an already existing format, WordPerfect won't let you leave the Edit Paper Definition screen until you change the name for Paper Type. If you run into this problem, simply choose Paper Type and then Other. Then enter any name you like for the paper type.—*M. David Stone*

■ SPREADSHEETS

Changing Tooltip Descriptions in Excel 5.0

TIP Microsoft Excel 5.0's tooltip feature makes it easy to learn what the various toolbar icons do: Simply point to an icon and read the description that drops down. It's much harder to change those descriptions, however, or to create descriptions for custom toolbar icons.

I wrote a simple macro that closes the active file. I assigned this macro to an icon and added it to the standard toolbar. The icon was to say, "Close active file," but instead insisted on saying, "Custom." The on-line help and the Excel reference book were of no help, so in desperation I called Microsoft. The Microsoft support technician kindly gave me the simple macro listed in Figure 3, which I pass along to other users who face a similar difficulty. (You can download it from PC MagNet's Utilities/Tips Forum as TOOLTP.XLS.)

Just insert a new module into any Excel 5.0 workbook, type the macro, and

then run it. It will cycle through each icon in the standard tool bar, showing you the current tooltip descriptions, which you can change at will. To use the macro with a different toolbar, simply substitute the toolbar's name for Standard in the Set MyToolbar line. For example, to cycle through the Chart toolbar icons, modify the line to read

```
Set MyToolbar = Toolbars("Chart")
```

Note that you need to run the macro only once for any toolbar. If you change the description of a toolbar icon, your new description remains in effect even if the macro is no longer in memory.

*Roger W. Martin
Goodlettsville, Tennessee*

► **PC MAGAZINE:** Microsoft made customizing Excel's toolbars easy but buried the information about changing tooltip descriptions. If you choose Contents on the Help menu and click on Programming with Visual Basic, you must then click on Objects, then click on the letter T, then click on ToolbarButton, then click on Properties, then click on Name, and then wade through the 428-word essay that appears. You will be informed that the Name property of the ToolbarButton object records the name of the button as a string. Even after you get that far, you'll

currently available toolbars. You'll need this information if you're planning to modify the Set statement at the top of Mr. Martin's macro.

If you simply want to modify the tooltip description for one icon, you don't need to re-create the entire Tooltip Changer macro. You can instead enter a single statement in Visual Basic, Applications Edition. For example, the Print icon—the fourth tool on the standard toolbar—is a shortcut for both the Print command and the Print Preview command. (The Print command icon becomes a Print Preview icon if you hold down the Shift key when you click.) You can make Print's tooltip description reflect that fact by following these steps:

- In any Excel 5.0 workbook, choose Insert Macro and then choose Module from the cascading submenu.
- Press Ctrl-G to open the Debug window in Visual Basic, Applications Edition. Then click the Immediate tab to get to the Immediate window.
- Type in the following line and then press Enter:

```
toolbars("standard")  
.toolbarbuttons(5).name="Print  
(press Shift for Print Preview)"
```

For a different icon or a different toolbar, substitute the appropriate position num-

```
'Tooltip Description Changer Macro  
'  
'  
Sub ChangeTooltips()  
    Set MyToolbar = Toolbars("Standard")  
  
    For Each MyTool In MyToolbar.ToolbarButtons  
        Message = "Enter a new tooltip description"  
        Title = "Tooltip Changer"  
        Default = MyTool.Name  
  
        'If tool is not a gap, display input box  
        If Not MyTool.IsGap Then  
            MyValue = InputBox(Message, Title, Default)  
  
            'Change tooltip name  
            MyTool.Name = MyValue  
  
        End If  
    Next  
End Sub
```

Figure 3: This macro cycles through each icon in the standard tool bar, showing you the current tooltip descriptions and allowing you to change those descriptions.

have to figure out for yourself that the button's name is also its tooltip description!

By right-clicking any Excel toolbar, you can see a list of the names of all cur-

ber in the parentheses following toolbar-buttons or a different name in the parentheses following toolbars.

Loosely translated, the statement above says to VBA: Let the name of the



World Class. Again.



Talk about heavy medal. We just won the 1994 PC World World Class Award for Best Mail-Order Company—for an unprecedented fourth time! Apparently, a lot of PC users have discovered our toll-free technical support, \$5 overnight shipping, low catalog prices, and knowledgeable salespeople. See how it feels to deal with a winner—give us a call today and experience the difference!

PC Connection®
800-800-0004

We're World Class

Call for a FREE Catalog!
800-800-0004

The Best By Any Measure. Since 1982,

PC Connection has pioneered the services that have set the standards for mail order, like

\$5 Overnight Shipping
Toll-free Technical Support
Customized Systems Overnight

And we have more than 3500 different products in stock; so if you don't see something, just give us a call. Version numbers are current at press time.

Note: Products listed in red are Microsoft Windows Applications.



HOURS:

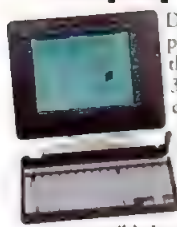
8 a.m. Monday continuous
thru 5 p.m. Sunday ET

COMPUTERS

Monitors not included with systems.

Compaq Computer ... 3 years	
11415 Contura CX w/209MB, Windows ...	\$2799.
11416 Contura CX w/120MB, Windows ...	2599.
11417 4/25c w/209MB, Windows (wsl) ...	2399.
11418 4/25c w/120MB, Windows (wsl) ...	2099.
IBM PC Company	
4263 ValuePoint Si 4/25 w/120MB ...	929.
4273 ValuePoint Si 4/33DX w/120MB ...	1249.
10496 ThinkPad 360 Mono w/120MB ...	1999.
11786 360CS Dual Scan Color w/170MB ...	2599.
15997 510CS Dual Scan Color w/200MB ...	2399.
NEC Technologies Inc.	
12941 Ready Multimedia 4/33DX w/ 270MB	1449.

Compaq Concerto

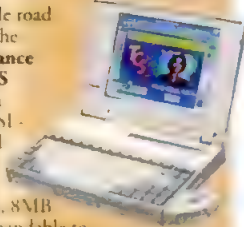


Discover the ease of pen computing with the **Concerto 4/33**. 33MHz 486DX w/ coprocessor, 8K cache, 4MB of RAM, 9.5" passive matrix monochrome VGA display, 101 KEY compatible keyboard with special-feature hotkeys, 250MB Drive.

13557 Concerto 4/33 M250	\$1399
13558 Concerto 4/25 M120	1229.
13553 Concerto 4/25 M250	1319.

Toshiba T4700CS

Affordable road power! The **Performance T4700CS** features a 50MHz 586 enhanced 486DX2 (3.3V), 8K cache, 8MB RAM expandable to 24MB, 9.5" Dynamic-STN color LCD display, audio capabilities, 200MB Drive.



14354 Performance T4700CS	\$3199
14355 T4700CS (320MB)	3449.



New After Dark 3.0

Berkeley's **After Dark 3.0** is wilder, weirder, and wackier than ever! Watch Bad Dog trash your desktop, try your luck at the track with Rat Race, and soar with the majestic, new Flying Toasters!

9885 After Dark for Windows 3.0	\$2995
---------------------------------	---------------

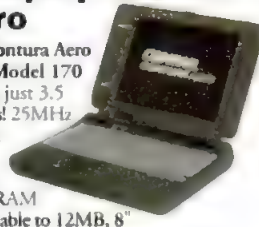
Texas Instruments TM 4000E Systems

13312 WinDX 2/50 Mono w/200MB	\$2279.
6441 WinDX 2/50 Active Matrix 200MB	2879.
8934 WinSX/25 Mono w/120MB	1679.
1620 WinDX 4/75C Active Matrix 340MB	3639.
1623 WinDX 4/75C Active Matrix 455MB	4479.
Toshiba Satellite Laptops	
14354 T4700CS Passive Color w/200MB	3199.
14355 T4700CS Passive Color w/320MB	3449.
14347 T3400 Mono Subnotebook	1739.
14348 T3400CT Active Color Subnotebook	3419.

BUSINESS APPLICATIONS

Aldes	
14335 TouchBase for Windows	29 95
Borland ... while supplies last	
11907 dBASE 5.0 for Windows	349 95
11945 dBASE 5.0 for Win. Version Upg.	199
Claris Corporation	
6022 CWorks 65 95 5257 FileM Pro 2.1	119 95
Intuit	
2426 Quicken for DOS or 5596 Win. ea.	42 95

Compaq Contura Aero



The **Contura Aero 4/25 Model 170** weighs just 3.5 pounds! 25MHz 486SX w/8K cache, 4MB RAM expandable to 12MB, 8" backlit VGA monochrome display, built-in trackball, 170MB Hard Drive.

15748 Contura Aero 4/25 Model 170	\$1419
15747 Contura Aero 4/25 Model 84	999.

Apple Computer

The affordable, new **Apple Newton MessagePad 100** is here! Features updated 4MB ROM, 640K RAM, and 20MHz processor for improved performance. Built-in notepad, to-do list, datebook, name file, calculator, pop-up software keypad—plus great low price!



1338 Newton MessagePad 100 ... **\$399.**

The **Apple Newton MessagePad 110** is the ultimate PDA! Features sleek, compact case, 1MB RAM, increased battery life. Puts a world of capabilities in the palm of your hand, yet it weighs just 1.28 pounds!

1332 Newton MessagePad 110	\$599.
14197 Windows Connection Kit	99.95

Lotus

5982 SmartSuite \$469.95 11771 Upg.	\$289.95
3428 1-2-3 4.0 - Win Upg (3424 51/4")	99.95
MECA ... 60 day MBG	
2798 Manor. Your Money 10.0 (31/2" only)	34.95
Microsoft	
7009 Windows 3.11 (7010 51/4")	95.95
7811 Word 6.0 299.95 5509 Acc 2.0 (31/2")	299.95
8138 Office 4.2 479.95 11336 Upgrade	279.95
Road Scholar Software, Inc.	
1318 City Streets	59.95
Software Publishing	
4402 Harvard Graphics 2.0 (4403 51/4")	279.95
Symantec	
1625 ACT! DOS 2.11	264.95
7435 ACT! Windows 2.0 (31/2" only)	189.95
WordPerfect Corporation (wsl)	
15866 InfoCentral 1.0 (31/2" only, wsl)	99.95
3795 WordPerfect 6.0 (wsl)	299.95
12914 for Win. 279.95 12963 for Win. Upg.	89.95

GRAPHICS & DESIGN

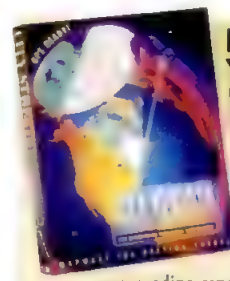
Abacadate, Ltd.	
13046 Design Own Home - Arch Windows	29 95
Adobe Systems	
2296 Adobe Photoshop w/ video	569.95
12973 Illustrator	449.95
Aldus	
13731 PageMaker 579.95 6878 Upg.	145.95
1085 FreeHand for Windows (31/2" only)	389.95
Altamira	
15573 Composer	529.95
Altys Corporation	
8875 Fontographer for Windows 3.5	259.95
Corel Systems	
8498 CorelDRAW! 5.0 CD-ROM	459.95
11895 4.0 CD-ROM 269.95 2618 3.0	99.95
Fractal Design	
4356 Painter 2.0 259.95 13218 Painter X2	89.95
HSC Software ... 30 day MBG	
13956 Kar's Power Tools Windows	119.95
Inset Systems	
3820 HiJack PRO 2.0 for Win. (31/2" only)	84.95
7114 ODgler	19.95
Micrografix	
15742 Windows Draw! Value Pak	48.95
7307 Designer 4.0 (31/2" only)	469.95
North Coast Software	
15884 Morphology CD-ROM	19.95
6992 PhotoMorph 1.0 for Windows	89.95
Shapers	
Visio Exp. SSuite or MS Office ea.	48.95
5426 Visio 2.0 for Win. (31/2" only)	119.95
T/Maker	
4680 Incredible ImagePak Windows	89.95
15062 Studio Ser. Design Group CD-ROM	189.95

COMMUNICATIONS

Asante Technologies Hubs ... 5 years	
2775 8 Port ... 249.	2772 12 Port ... 499.
Artisoft Simply LANtastic	
15595 Starter Kit 199.	14742 Add-on Kit 99.95
BOCA Research FaxModems ... 5 years	
8397 M1411W... 99.95 8398 M144EW...	129.95
Data Storm PROCOMM PLUS	
4798 2.01 69.95 2006 2.0 Windows	95.95
DCA/Crosstalk	
5611 Crosstalk 2.0 for Windows	99.95

Deirina Technology

2446 WinFax PRO 4.0	\$84.95
14072 Communications Suite	119.95
Hayes ... 2 years	
11396 Accura 144-Fax144 (external)	149.95
1118 Accura 288-FAX144	279.95
12820 OPTIMA 288-FAX144	449.95
Hilgraeve HyperACCESS	
12081 Windows ... 84.95 8204 DOS	59.95
IBM	
13207 FaxModem (int.) (P/N MOD531)	49.95
Intel ... 3 years	
2994 EtherExpress 16 or 3021 16 TP ea.	99.95
5994 SatusFaxModem/400	285.95
12934 14.4 PCMCIA FaxModem	209.95
Megahertz ... 5 years	
10515 CS144 14.4 FaxModem (Compaq)	419.95
12763 XJ1144 14400 FaxMod. (PCMCIA)	219.95
Microcom ... 30 MBG	
CarbonCopy DOS or Windows	129.95
14931 DP FAST 28.8 ES 249.95 14932 EP	339.95
Norton-Lambert	
2754 Close-Up Host & Remote 6.0	119.95
Novell Netware 4.01	
12058 (10 user) ... 1999.	12056 (25 user) ... 3049.
Practical Peripherals ... lifetime	
4744 PM144MT II	129.95
4804 PM288MT II V.F.C.	259.95
Server Technology	
7779 Remote Power on/OFF+Aux	119.95
Shiva	
14837 NetModem/E 1.5	1479.
Supra FaxModems ... 5 years	
5252 144LC FxM 129.95 2393 FxM 28.8K	249.95
Traveling Software	
4407 LapLink V	89.
U.S. Robotics	
11923 Spectr. 14.4 FM Int. 124.95 11924 Ext.	149.95
6631 WorldPro 14.4 PCMCIA FaxMod	209.95
12618 28.8 FM (ext.) 239.95 12619 (int.)	219.95
Zoom Telephonics ... 7 years	
14763 FaxModem VFP 28.8K (internal)	189.95
15364 FaxModem VFX 28.8K (external)	229.95
4428 FaxModem VFXV .32 bis (external)	139.95
4429 FaxModem VFPV .32 bis (internal)	99.95



Find Your Way

Road Scholar's City Streets for Windows gives you powerful

map-reading capabilities. Import maps and instantly find any address, calculate distance, zoom in and out, and more. Provides support for Global Positioning System.

1318 City Streets	\$59.95
-------------------	----------------

You're The Winner.

PCTV

EXPERT ADVICE
FREE ON TV!

Don't just read about new computer products...
Watch them in action on:

COMPUTER CHRONICLES

MacTV PCTV

For schedule information call:

603-863-9322



Stewart Chesler

Xerox
13028 TextBridge (OCR)..... \$65.95

VIDEO & SOUND

Adobe Systems ... 120 day MBG
12891 Premiere 1.0 for Win. (31/2" only) 179.95
Advanced Digital Systems
13985 VGA TV-Eine 249.95 15138 (int.) 189.95
ATI Technologies Graphics Pro ... 5 years
14101 Graphics Xpression 64 Accelerat. 219.95
Cardinal Technologies ... lifetime
1543 Sensory Starter Multimedia Kit ... 249.95
Creative Labs ... 1 year
5770 Sound Blaster 16 MCD ASP 179.95
3203 Game Blaster Multimedia Upp. Kit 419.95
Diamond Computer ... 5 years
Stealth 32 PCI or VLB 1MB ea. 179.95
1585 Viper VLB 349.95 15000 PCI 365.95
Hauppauge
2442 WinTV Celebrity NTSC 299.95
10583 WinTV w/Microsoft Video Win. 419.95
Intel ... 3 years
11587 Smart Video Recorder 369.95
MAG Innovation Monitors
16194 DX17F 759. 16195 DX15F 408.
NEC MultiSync Monitors ... 2 years
14317 3V 499.95 11948 4FGE 659.95
Number Nine
1871 #9GXE (1MB) ISA 3230 VLB ... ea. 249.95
Sony ... 1 year
15672 CDU33A (internal DS CD-ROM)..... 159.95
11810 155F 15" Monitor 499.95
14112 GDM-17se1 17" 1099.

DRIVES

Colorado Memory Systems ... 1 year
4354 Jumbo 250 Tape Backup 179.95
1073 Trakker 250 Tape Bckp. (parallel) 349.95
Iomega ... 1 year
13803 Bernoulli Insider 150 IDE 489.95
10602 Bernoulli 150MB Cartridge 99.95
10452 Transportable MultiDisk 150 559.95
10537 PC Powered 150 PRO 479.95
2530 90MB Cart. 89.95 2467 Tripak 259.95
MDS ... 1 year
11851 105MB 3.5" Int. Removable IDE ... 279.95
12534 Sys. 270MB Removable Drive 499.95
NEC CD-ROM Drives... 2 years
13341 CDR-500 MultiSpin 3xi 469.95
13340 CDR-600 MultiSpin 3xe 499.95
TEAC AT Drives ... 1 year
6951 1.2MB 55.95 7371 1.44MB 44.95

Inset Systems



Convert 70+ image formats, capture screens, and browse image "thumbnails" with
Hijaak PRO for Windows. View images regardless of format with
Oogler. Simply click & view! View PhotoCDs, CompuServe GIFs, & more.

3820 HiJaak PRO \$84.95
2.0 for Windows
7114 Oogler 19.95

Call for latest prices.



Great Drive Deals

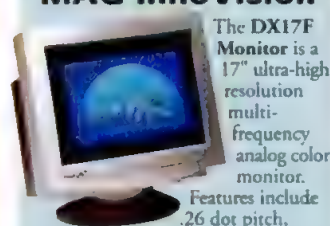
Conner FilePro Hard Drives offer an exceptional data storage value. These internal drives offer 14ms or faster access time, self-parking heads, and buffers for superfast data retrieval.

14307 CFS 210A (213MB) \$229.95
14306 CFA 340A (343MB) 289.95
14303 CFS 420A (428MB) 329.95

ACCESSORIES/DISKS

American Power ... 2 years
3819 Back-UPS 250 109.95 3858 400 ... \$169.95
Cyrix Microprocessor Upgrades
10538 486 DRX2 25/50 Microproc. Upp. ... 299.95
14035 486 SRX2 20/40 Microproc. Upp. ... 239.95
2563 486 DRX2 33/66 Microproc. Upp. ... 339.95
Fuji Disks ... lifetime
2215 3.5" HD (10) 10.95 6286 3.5" HD (20) 19.95
Intel ... lifetime
3573 DX2 Overdrive Processor 66MHz 319.95
Kensington Full line avail. ... 1 year
7060 PowerSaver Security System 39.95
PC Power & Cooling ... 2 years
7915 Turbo Cool 300 159.
Sony Disks/Cartridges
6375 3.5" HD (30)..... 29.95 11871 (100).... 79.95
Targus Cases ... lifetime
7369 Netopac..... 35.95 1305 Universal 69.
Tripp Lite ... 2 years
6199 Isobar 4-6.... 43. 6200 Isobar 6-8.... 49.

MAG InnoVision



The DX17F Monitor is a 17" ultra-high resolution multi-frequency analog color monitor. Features include .26 dot pitch, intelligent mode switching, digital controls, and maximum resolution of 1280 x 1024 non-interlaced.

16194 DX17F Monitor \$759.
16195 DX15F Monitor 409.

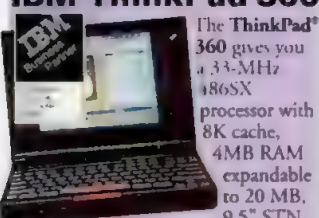
PROGRAMMING/UTILITIES

Berkeley Systems
6642 Disney Coll. Scrn. Saver (31/2" only) \$29.95
After Dark DOS or Windows 29.95
5434 Star Trek: Screen Poster/Saver Bun. 39.
Central Point Software PC Tools
12833 Pro... 94.95 11395 for Windows ... 89.95
Chili Pepper Software
15994 Infinite Disk 79.95
DataViz, Inc.
6508 Conv. Plus for Win. 2.5 (31/2" only) 89.95
Delrina
9853 Opus 'n Bill Screen Saver 29.95
Helix Software
9827 Netroom 3 (single user)..... 59.95
MicroHelp, Inc.
14787 Uninstaller for Windows (31/2" only) 39.95
Microsoft
10154 Visual Basic SE 129.95 10437 Pro 319.95
11504 Visual C++ Pro 1.5 (CD only) 399.95
Pacific Microelectronics
13089 Mac-In-DOS for Windows 95.
PowerSoft
15847 PowerBuilder Desktop 229.95
12930 PowerViewer 84.95
12929 PowerMaker 169.95
Qualitas
12541 386MAX 7.0 (31/2" only)..... 61.95
Quarterdeck
3217 OEMM 7.0 (3221 514")..... 59.95
Symantec
2360 Norton Desktop Windows 115.95
5136 The Norton Utilities 8.0 115.95
8535 pcAnyw. DOS 119.95 11303 Win. 129.95

INPUT/OUTPUT

Caere ... 1 year
4277 OmniScan (w/OmniPage Direct) 209.95
Canon Bubble Jet Printers ... 1 year
15187 BJ200E 299.95 9614 BJ-600 Color 589.95
CoStar ... 1 year
2365 LabelWriter XL Plus 239.95
Epson ... 1 year
11800 LQ570+ (80 col., 269 cps)..... 259.95
12353 Action Laser 1800 1029.95

IBM ThinkPad 360



The ThinkPad® 360 gives you a 33-MHz i86SX processor with 8K cache, 4MB RAM expandable to 20 MB, 9.5" STN-

LCD backlit display with 64 gray scales, local bus graphics, 1MB video RAM, NiMH battery, 170MB Drive.

10496 ThinkPad® 360 Model 170 \$1999.
10497 ThinkPad® 360 Model 340 2499.

Hewlett-Packard ... 3 years

4178 LaserJet 4 Plus \$1499.95
13682 LaserJet 4P 999.95
12212 LaserJet 4L 699.95
15857 Color DeskJet 560C 579.95
IBM Keyboards
13488 Basic (570) 57.95 13485 Pro (571) 89.95
Kensington Mouse ... 1 year
7899 Expert 4.0 (ser.) 99.95 7900 (bus) 114.95
Logitech ... limited lifetime
3996 Trackman2 (combo) 89.95
3295 Mouseman (combo) 45.95
7133 PowerPage (scan, fax, copy, & OCR) 499.95
7463 ScanMan Easy Touch for Windows 229.95
Microsoft ... lifetime
7597 Serial Mouse 69.95 2898 w/Win 144.95
1896 Ballpoint Mouse 79.95
Microtek ... 1 year
13362 Scan-in-Dex 219.95 13361 Scooter 299.95
13360 ScanMaker IISr 749.95 13359 IISc 429.95
1679 ScanMaker III 2459.95 1690 IISm 1069.95
Seiko ... 1 year
1506 Smart Label Printer Pro 249.95
Texas Instruments microLaser Pro 600
13658 microLaser Pro 600 PS23 1399.
13659 microLaser Pro 600 PS85 1599.
UMAX ... 1 year
15897 VISTA 599.95
13514 ScanOffice for Windows 739.95

PC Connection®

800-800-0004 994PCM

6 Mill Street, Marlow, NH 03456

SALES 603-446-0004 FAX 603-446-7791

OUR POLICY

- VISA, MASTERCARD, AMEX. No surcharge
- Your credit card is not charged until we ship.
- If we must ship a partial order, we pay freight on shipment(s) that complete the order (in U.S.).
- No sales tax, except Ohio (please add applicable tax).
- All U.S. shipments insured, no additional charge
- APO/FPO orders shipped First Class Mail
- International orders: Add 2% surcharge and \$2.30 insurance. Manufacturer support and upgrade eligibility may be limited outside the U.S.A. Some products not available for export, call or fax for information.
- COD maximum \$1000. Cash or certified check. COD orders require an additional \$4.50 charge, ship via UPS and may require add'l UPS charges.
- 120 day limited warranty on all products.
- Defective software replaced immediately
- Defective hardware repaired or replaced at our discretion. All items subject to availability. Prices and promotions subject to change without notice
- We are not responsible for typographical errors.

SHIPPING

Continental U.S.: Total shipping charge on any order is \$5. Barring events beyond our control, all credit card orders (non-CODs) phoned in weekdays by 3 a.m. ET will ship Airborne Express for delivery the next business day. That's same day delivery for orders placed between midnight and 3 a.m. (Some orders ship UPS Ground for next day delivery) Saturday delivery available to many areas upon request at no additional charge. Order all day Saturday thru noon Sunday for Monday delivery. Some areas required an extra day delivery

Hawaii, Alaska, Canada, Puerto Rico & U.S. Virgin Islands: Shipping may require additional time/charges

All other areas: Please call 803-446-0004 or FAX 603-446-7791 for information. Business offices: 803-446-7711 M-F 9 a.m. - 5:30 p.m. ET.

HOURS

8 a.m. Monday continuous thru 5 p.m. Sunday ET

fifth button on the standard toolbar be "Print (press Shift for Print Preview)". Why the fifth button, not the fourth? The reason is that the gap that normally appears between the Save and Print icons is in fact button four. If you try to assign a name to this button, you'll get a runtime error.

After experimenting with renaming toolbar icons, you may, of course, decide that the original names weren't so bad after all. To restore a default name using Mr. Martin's changer macro, just click the Cancel button when the current description of that icon appears. To restore a default name using the Immediate window, type a pair of quote marks with nothing between them on the right side of the equals sign.

You can also restore all the default tooltip descriptions at once by deleting the file EXCEL5.XLB from your Windows directory. You'll get the factory default toolbars the next time you start Excel. This is a drastic step, however, because in the process of restoring the default descriptions, you will also lose any changes you've made to the layout of the built-in toolbars. You'll also lose any custom toolbars that you have created. Instead of deleting the .XLB file, then, you might simply want to rename it. That way you can always undo your undoing.

—Craig Stinson

■ GRAPHICS

Two Queries About Font Overload

❓ Every program I buy comes with fonts of some sort, all of which are taking up lots of disk space. Worse, when I delete a program, I don't know which fonts to delete. My suspicion is that some of these fonts should work with multiple programs. At least, the Windows programs should be able to share fonts.

Can you make some sense of this for me? I have Microsoft Windows 3.1 with Adobe Type Manager, Version 2.5 installed. I also run the following DOS programs: Microsoft FoxPro, Version 2.5; Quattro Pro for DOS, Version 4.0; and WordPerfect for DOS 6.0. Here's a summary of the directories and fonts that I can find:

Directory	Font extension
BT Fonts	.SPD
FONTWARE	.BCO, .CSD, .TDF
FONT	.SFP
PSFONTS	.PFB

Which of these fonts can be made to work together, and which can safely be deleted?

Richard Leonetti
Portland, Oregon

❓ I have over 6.5MB of Adobe Type 1, Bitstream Speedo, TrueType, and WordPerfect scalable fonts, not to mention another 3.5MB of bitmapped soft fonts for my HP LaserJet. I know how the bitmapped soft fonts work as well as how to identify and get rid of the ones I don't need, but the scalable fonts are a mystery. In particular, I have TrueType fonts with .FON, .FOT, .TT, and .TTF extensions, such as LBLACK.FOT, LBLACK_1.FOT, LBLACK.TT, and LBLACK.TTF. Since there is only one Lucinda screen font and one printer font, why are there four different extensions?

My Adobe Type 1 font directories present an even worse nightmare: Fonts in that directory have an .AFM, .PFB, .PFM, .WAO, and .WFA extension for nearly every single typeface. I know that the .WAO and .WFA files are created by WordPerfect 6.0 for DOS. But are all five file types really necessary for running both Windows and DOS (specifically WordPerfect) programs?

Another major problem is that there is no obvious way to correlate font names with the actual filenames, so it's difficult to tell which files should be deleted. For example, I suspect that WPO00B?.WFA, WPCOB1??.PFM, WPCOB1??.AFM, WPCOB??.AFM, WPCO00D?.WFA, WPCO00I?.WFA, and WPCO00N?.WFA are all variations of the same font but can't be sure, and each of these files occupies about 40K of disk space. Obviously, any duplicate or unnecessary files are wasteful and should be deleted. How do I safely get rid of whatever I don't need without blowing out the typeface entirely?

Vern Larson
Camarillo, California

► **PC MAGAZINE:** Anyone who has ever tried to clean up the fonts on a PC—in-

cluding me—sympathizes with your very legitimate frustrations. But as long as we have application programs that install fonts without permission, font-installation utilities that don't give us a preview *before* copying a font to disk, and a mixed bag of DOS and Windows programs, we're going to have font-management problems. Because it is easiest to identify a font format by its extension, I've organized the following information by file type.

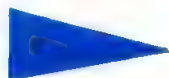
The .AFM, .PFB, and .PFM extensions all denote Adobe Type 1 fonts. Adobe Type Manager needs the .PFB (font outline) and .PFM (font metrics) files to show fonts on-screen and rasterize them at print time. The .AFM files are used during installation to create the .PFM files and can be safely deleted from your hard disk. Here's an easy way to correlate any Type 1 typeface name with its DOS filename: Simply open up the ATM.INI file (found in the Windows directory) and print it. All of the currently installed Type 1 fonts will be in a list that includes typeface, path, and filename.

The .WFA and .WAO files are specially parsed versions of the standard Adobe .PFM files. They are created by WordPerfect to speed up the screen redraws and printing times of PostScript fonts under DOS. They are created only for those fonts that you actually use in a WordPerfect document and are not created when you choose the PostScript option during WordPerfect's installation procedure. You can delete the .WFA and .WAO files with impunity. WordPerfect will simply re-create them the next time you use PostScript fonts.

The .FOT, and .TTF are the only two font file types required to work with TrueType under Windows. According to Microsoft, the files with truncated extensions of .TT or slightly modified filenames are almost certainly discardable duplicates. I'd advise you, however, to take the conservative approach. Don't immediately delete these files from your hard disk. First, make sure that all of your TrueType fonts are currently installed (specifically, make sure that you haven't used a font-management program to uninstall any fonts temporarily). Then, open up the WIN.INI file and look for the section titled [fonts]. All of the TrueType fonts

For Printers, It's Arlington!

Thousands
of Printers
In Stock!



OKIDATA

OKILASER 400e - \$495.00



- 4 PPM
- 300 DPI
- 512K Ram
- RISC Processor
- Emulated HP IIP
- 44 Resident Fonts

Tank Tough®

OKILASER 410eps - Call
OKILASER 410e — \$645.00



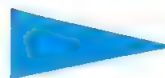
600 DPI
Class Output

- HP III Compatible
 - 2 MB Ram
- OL810-\$899 OL830-\$1079 OL850-\$1189**

MICROLINE 590



- 24 pin
 - 120 CPS LQ
 - 360 CPS
 - 8 Fonts
- | | | | |
|-----------------|-------|------------------|--------|
| 184 Turbo | \$219 | ML590 | \$409 |
| ML320 | \$295 | ML591 | \$559 |
| ML321 | \$415 | ML395 | \$949 |
| ML380 | \$205 | ML3410 | \$1199 |
| ML520 | \$365 | DocIt 3000 | \$1799 |
| ML521 | \$489 | DocIt 4000 | \$2199 |



Canon

After
Rebate
Until 8/31/94!

BJ-600 — \$529.00*

Great Color All Around. Whether you're printing text, graphics, or even photographs, the BJC-600 will give you sharp and vivid 360 dpi color output.



- Perfect on plain paper.
- 20 Scalable Fonts.
- A separate ink cartridge for each color, so you don't have to replace all other colors when one runs out.

LBP-430 — \$549.00* LBP-860 — \$1069.00*
BJ-10SX - Portable — \$209.00*

BJ-200e — \$249.00

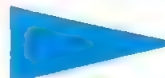
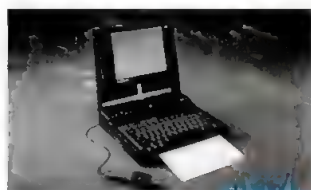
In Stock — the BJ-200e with improved enhancements to the BJ-200, which was the November 1993 PC Magazine's Editor's Choice.



- Up to 33% faster text throughput
- Dramatically improved graphics
- 20 true type fonts
- Reduction mode added

BJ-230 - Wide Carriage \$359.00*
BJ-100 \$229.00*

- | | |
|------------------------------|-----------|
| Notebook 486-SL 120 MG | \$1199.00 |
| Notejet 486-85 120 MG | \$1849.00 |
| Notejet 486 200 MG | \$1929.00 |
| Dual Scan Color | \$1749.00 |
| Notejet 120 MG - Color | \$2429.00 |
| Notejet 200 MG - Color | \$2499.00 |
| Notejet II 50 MHZ-130 MG ... | \$2759.00 |
| Notejet II 50 MHZ-260 MG ... | \$2939.00 |



EPSON

- | | |
|-----------------------------|--------|
| LX300 | \$169 |
| FX870 | \$259 |
| LQ1170 | \$345 |
| LQ570+ | \$235 |
| LQ870 | \$425 |
| LQ1070+ | \$355 |
| LQ1170 | \$589 |
| LQ2550 | \$879 |
| DFX5000 | \$1299 |
| DFX8000 | \$2189 |
| Action 3250 | \$169 |
| Action Laser 1500 | \$639 |
| Action Laser 1500-2MG | \$699 |
| Action Laser 1600 | \$929 |
| Stylus 400 | \$229 |
| Stylus 800+ | \$239 |
| Stylus 1000 | \$429 |
| Stylus Color | \$549 |



ACTION LASER 1500
• PC Computing - "Best PCL5"
• 27 Fonts
• PCL5 Compatible
• 6 PPM **\$639.00**

ACTION LASER 1100
• 300 dpi
• 4 PPM
• PCL5 Emul.
• 22 Fonts **\$479.00**

Highest print resolution available in an ink jet printer.

720 dpi print resolution

- Produces the finest color images that are difficult to distinguish from a photographic image.
- EPSON's special 720 dpi coated paper eliminates ink from spreading when it hits the page.

360 dpi resolution

- Produces excellent photographic images and the finest color images (non-photographic images, such as standard business graphics).
- Produces the finest monochrome text printing.
- Plain paper or bond paper can be used when printing at this resolution.

Stylus COLOR
INK JET PRINTER

The most advanced color ink jet printer not only in its price class, but in the industry!

\$549.00



FOR ORDERS & QUOTES:
800-548-5105

Arlington
Computer
Products, inc.

For Value, It's Arlington!



**COLORADO
MEMORY SYSTEMS INC.**

intel.



JUMBO TRAKKER 250 EXTERNAL - \$299.00

- 250 MB capacity
- Plugs into parallel port
- Dual connector shares port with a printer

Jumbo 120 Internal \$99.00
Jumbo 250 Internal \$155.00
Power Tape 2400 Int. \$929.00
250 Meg Tapes Formatted .. \$17.00

INTEL OverDrive Processor



Intel OverDrive™
Single-chip
processor
upgrades
that maximize
your PC's
performance.

SX2-Double 20-25 MHZ ... \$179.00
DX2-50 Double 20-25 MHZ \$225.00
DX2-66 Double 33 MHZ ... \$289.00

Want to see a spectacular performance at an affordable price? Then add an OverDrive processor to your Intel 486 SX or DX CPU-based system. Choose from our complete family of OverDrive processors. And watch your power-hungry software take off.

Intel OverDrive processors improve performance of all applications. So you'll fly through your workload with the greatest of ease.

Using Intel's innovative "speed doubling" technology, OverDrive processors run at twice the speed. Applications open and run faster. And you no longer have to wait for that hourglass to disappear.

CHIPS

Special Orders - Please Call!

1MB/4MB Simms \$45/\$149
16 MG Simms \$649
Compaq Memory CALL
Epson Action 2 MG \$139
Cyril SRx2-20/40 \$219
Cyril DRx2-20/40 \$219
Cyril DRx2-25/50 \$259
Cyril DRx2-33/66 \$299
HP 4MG Upgrade \$159
Intel 80387 SX/DX \$75/\$85
OKI Laser 2MB \$125

SHARP

JX9400 \$449
JX-9460 \$769
JX-9660PS \$1219
PC-8650 \$2599
PC-8650II \$2749
PC-8660 DX2-50 Active .. \$3595

LEXMARK

4029 Laser Printer 10 ... \$1109
4037 5E LED \$639
Laser 4039 10R \$1269
Laser 4039 12R+ \$1389
Inkjet 4076 \$275
2380+/2381+ \$305/\$435

HEWLETT-PACKARD

Laserjet IV/IV+ \$1299/\$1429
Laserjet IVP w/Toner \$959
Laserjet IVMP w/Toner .. \$1369
Laserjet IVL w/Toner \$675
Laserjet IVML/w/Toner .. \$1039
Laserjet IVM+ \$1949
Laserjet IV SI w/Toner .. \$2989
Laserjet IV SI MX \$4389
HP IIID \$1999
Paintjet XL300 \$2199
HP IV Toner \$99
Jet Direct 2371A \$389
Jet Direct 2382B \$419
1MG Upgrade \$69
2MG Upgrade \$99
4MG Upgrade \$159
8MG Upgrade \$319
Deskjet 256K \$69
Deskjet 310 \$299
Deskjet 550C \$429
Deskjet 520/560C ... \$289/\$569
Deskjet 1200C \$1399
Deskjet 1200C/PS \$2199
2P Scanner \$489
IIC Scanner \$949
Pacific Page/XL \$259/\$699
Pacific Data 25 in 1 Font . \$239

TEXAS INST.

486/DX2/50-200 MG \$2279
486/DX2/50E Color \$2829
486/DX4/75 \$3549
486/50E Active \$2829
MicroMark Color \$379
MicroWriter Basic \$499
MicroWriter PS23 \$675
MicroWriter PS65 \$935
Pro 600 PS23 \$1329
Pro 600 PS65 \$1529

NETWORKING

Netware 3.12 5 User \$569
Netware 3.12 10 User \$1299
Netware 3.12 25 User \$1869
Netware 3.12 50 User \$2349
Netware 3.12 100 User ... \$3399
Netware 4.0 10 User \$1599
Netware 4.0 25 User \$2299
Lantronic Starter 6.0 \$299
Lantronic 6.0 5-User \$329
Lantronic 6.0 10-User ... \$569
Node Runner 2000C \$169
Node 2000C 6-Pack \$999
Node Runner SI 2000 \$85
Node Runner SI 5-Pack .. \$425
T Runner 8-Port \$289
T Runner 12-Port T/P \$479
NE2000/5-Pack \$69/\$329
SMC Hub 8 Port T/P \$279
SMC TP 12 node Conc ... \$509
SMC+16-6 Pack \$579
SMC Ethercard +/-16 \$89/\$115
3 Com Link Builder \$629
3 Com Etherlink III \$115
Etherlink III 5-Pack \$469
Etherlink III 20-Pack \$1599
Intel Ether 16 \$89
Intel Ether 16-5 Pack \$429
Intel Ether 16-20 Pack ... \$1579
Intel Ether Flash 5-Pack .. \$479
Intel Ether Flash 20-Pack \$1799
Intel Eth. Cmbo/5-Pk \$115/\$509
Intel Ether Pro Call
Intel Ether MCA \$159
Intel Netport EL \$359
Intel Netport XL \$409
Intel Token 16/S \$329
Thom. Conrad 5143 Coax \$109
TC 5143 Coax 6-Pack \$629
TC 5143-10 BT \$85
TC 5143-10 BT 6 BK \$469
TCNS 100 Mbps \$435
Xircom Pocket Ethernet .. \$249
Xircom PCMCIA Ethernet \$229
Xircom Pocket Token \$439

DIGITAL

Decwriter 500I w/color ... \$399
Laser 1800 \$639
Colorwriter 1000 Call

SOFTWARE

Aldus Pagemaker 5.0 \$499
Corel Draw 4.0-CD \$279
Corel Draw 4.0 Upgrd \$209
D Base IV \$379
Harvard Graphics 2.0 \$149
Harvard Graphics 3.0 \$359
Lotus 123 2.4/3.4 ... \$279/\$325
Lotus 123 4.0 \$279
Lotus Smart Suite \$379
Lotus Notes Starter \$789
Microsoft Access 1.1 \$295
Microsoft Office \$449
Microsoft Office Pro \$509
Microsoft Word \$289
Microsoft Windows 3.1 ... \$79
Microsoft DOS 6.0 Upg. ... \$59
Norton 7.0 \$109
Q&A \$169
QEMM \$65
Win Fax Pro \$69
Word Perfect 6.0 \$249
Word Perfect Windows ... \$269
Word Perfect 6.0 Upgrd ... \$99

Panasonic
Office Automation

2023 \$179 3123 \$269
2130 \$199 4400 \$449
2124 \$295 4410 \$449
1624 \$379 4430 \$639
2624 \$389 4440 \$989
3624 \$389 5400 \$779
4410/4450I 2 MG ... \$129

SCAN. & DIGIT.

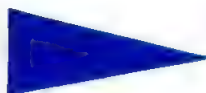
Calcomp 12 x 12-4 \$249
Calcomp 12 x 18-10 \$399
Canon 4015 Scanner \$899
Epson Scanning 600 \$649
Epson Scanning 800 \$859
Epson 1200 Prof. \$1189
Logitech ScanMan 256 ... \$169
Color ScanMan \$399
Mustek Paragon 1200 ... \$989
ScanMan w/Omni Page .. \$185
Summasketch 12x12 \$269
Summasketch 12x18 \$499

*After Rebate

**Arlington
Computer
Products, inc.**

FOR ORDERS & QUOTES:

800-548-5105

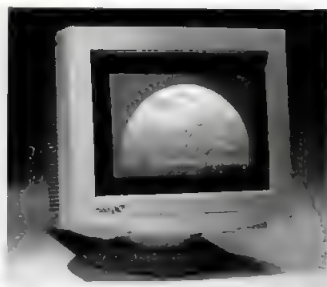


MAG
INNOVISION



DX17F

Ultra high resolution monitor with digital controls.



- 17", dark tinted, non-glare.
- 0.26 mm
- 1280 (H) x 1024 (V)
- Vertical 50-100 Hz
- Horizontal 30-64 kHz

\$659.00

LX1450LG	\$249.00	DX15F	\$349.00
MX21F	\$1759.00	MX15F	\$459.00
MX17	\$779		
MX17FG	\$819		

MONITORS



NEC

2V	\$329
3V	\$459
3FGE	\$549
4FGE	\$589
5 FGP	\$1079
5 FGE	\$969
6 FGP	\$1949

CTX

6468A/1451	\$229/\$249
1562/1765 GM	\$319/\$665

MITSUBISHI

Diamond Pro 17 FS	\$919
Diamond Scan 15 FS	\$409
Diamond Pro 21 FS	\$1949

NANAO

F3401W	\$649
F5501/F5501W	\$899/\$979
T5601/F5601W	\$1459/\$1229
F7601W	\$1969
T6601	\$2049

SONY

CPD-1730 17"	\$999
GDM 17SE-1	\$959
GDM 2036S	\$1939

VIEW SONIC

4E/6E	\$279/\$289
15E/VS15EX	\$369/\$399
15/17G	\$429/\$779
17	\$879
20/21	\$1499/\$1679

DRIVES & TAPES

Back Pack 250	\$339
Connor 250 Tape	\$149
Connor 212/540	\$169/\$319
Dual Floppy	\$99
3 1/2" 1.44	\$39

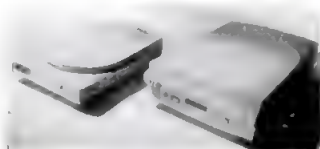
AMERICAN

250/400/450	\$99/\$159/\$189
600/900	\$259/\$359
1250	\$485
Smart 400/600	\$289/\$339
Smart 900/1250	\$479/\$619
Smart 2000	\$1029

SEAGATE HARD DISKS

213 MG 3243A	\$179
341 MG 3391A	\$239
420 MG ST1480A	\$259
452 MG 3491A	\$249
528 MG 3655A	\$329

CD ROM



NEC - TRIPLE SPEED

NEC 3Xe	\$429
NEC 3Xi	\$399
NEC 3Xp/4X Pro	\$379/\$869
Plextor 3028 Int.	\$309
Chinon 535 Int/Ext.	\$299/\$389
Soundblaster 16 SCSI 2	\$179
Texel 3028 Int/DS	\$289
Texel 5028 Ext/DS	\$329
Texel Quad Speed Int.	\$489

VIDEO BOARDS

ATI Mach 32	\$145
ATI Graph Prof 2 MG	\$259
ATI Prof Turbo - 2 MG	\$349
ATI Prof Turbo - 4 MG	\$539
Diamond Stealth Pro	\$219
Diamond Viper 2 MG	\$319
Diamond Stealth 64	\$319
Hercules Dynamite VLB	\$155
Hercules Graphite 2MG	\$369



Accura 14.4/Fax-Int/Ext	\$119/\$139
Accura 28.8	\$255
Optima 96	\$309
Optima 14.4+ Fax	\$349
Optima Pocket 14.4	\$289
Optima 28.8 Int/Ext	\$349/\$399
PCMCIA 14.4+ Fax	\$259



Practical Per. 14.4 Int.	\$105
Practical Per. 14.4 Ext.	\$119
28.8 Int/Ext	\$219/\$229
Pro Class 14.4 Int/Ext	\$149/\$159
PCMCIA 14.4	\$265
Pocket 14.4/28.8	\$259/\$369



14.4 w/Fax Int/Ext	\$89/\$109
PCMCIA 24/96	\$109
PCMCIA 14.4/14.4	\$189

SATISFACTION

200 2400 V.42/9800 Fax	\$199
400 14.4/14.4 Fax	\$259
400 Ext. 14.4/9600 Fax	\$289



14.4 Sportster External W/Fax
• V.42/MMP • 5 Year Warranty



Sportster 14.4 Int/Ext	\$109/\$129
Sportster 14.4 Int. Fax	\$115
Sportster 14.4 Ext. Fax	\$135
Sportster 28.8 Int/Ext	\$199/\$219
Terbo 14.4 Dual Std.	\$499
V.32 Terbo Fax	\$369
Worldport PCMCIA 14.4	\$195

ARLINGTON COMPUTER PRODUCTS... GREAT SERVICE SINCE 1984!

- PC Magazine "...Arlington offers worry-free mail order purchasing!"
- PC Computing - 1994: "A 10-year track record of consistent service!"
- PC Computing "...Courteous service and terrific technical support!"
- PC Computing Mail Order Review of Peripheral Specialists 8/93. We received the only 5 Star Rating for Price!

Prices and availability subject to change without notice. Qualified purchase orders accepted.

CIRCLE 336 ON READER SERVICE CARD

Hours C.S.T.
7:30-8:30 pm Mon-Fri
9:00-5:00 pm Saturday

1970 Carboy,
Mt. Prospect, IL 60056

NO SURCHARGE FOR CHARGE CARDS!

CUSTOMER SERVICE AND IN ILLINOIS
708-228-6333

SHIPPING
708-228-9748

TECHNICAL ASSISTANCE
708-228-1470

FAX
708-228-0516



Arlington Computer Products, inc.

FOR ORDERS & QUOTES:
800-548-5105

will have the word TrueType in parenthesis and will carry an .FOT extension. Comment out any fonts that you don't want or suspect are duplicates by inserting a semicolon as the first character of the line. Restart Windows, and if your applications run without a hitch and all the fonts you want are available to you, you can safely delete both the commented entries from the WIN.INI file and the associated files from the Windows\System directory. As a precaution, back up the WIN.INI file and the Windows\System directory before making the deletions.

The .FON extension is associated with both Windows bitmapped screen fonts and older Windows vector fonts. You might think that with scalable TrueType fonts it would be safe to delete all .FON files from your system, but you'd be very, very wrong. Windows and many Windows applications require screen fonts for optimal display. Unless you've installed a copy of Windows 3.1 over the older 3.0 (in which case you may really have old screen fonts that Windows no longer needs), I'd strongly suggest leav-

ing the .FON files alone. Without crucial .FON fonts such as Courier, MS Sans Serif, MS Serif, Small Fonts, and Symbol, Windows and Windows-based applications will look mighty strange on-screen. Several .FON files that aren't listed in WIN.INI (such as any .FON file that begins with DOSAPP, EGA*, 8514*, or VGA*) are absolutely required for correct device-dependent video display and for shelling out to DOS.

If you're so tight on disk space that you want to try your hand at deleting .FON files, do yourself a favor and follow the cautious instructions given for the .FOT fonts above: Try commenting the files out of WIN.INI before you actually delete them from your hard disk and make backups!

An .SPD extension identifies the scalable Bitstream Speedo font technology. While not as widespread as Type 1 or TrueType fonts, Speedo is nevertheless a flexible and widely accepted font technology. You can use Speedo fonts with your Windows applications provided you purchase Bitstream's font-rasterizing utility,

Bitstream Facelift (\$99, 800-522-3668). Many individual DOS-based programs—including WordPerfect 6.0 for DOS and Quattro Pro for DOS, Version 4.0—can access Speedo fonts if you've chosen the appropriate options during the application's installation procedure.

The extensions .BCO, .CSD, and .TDF are all bitmapped Bitstream fonts. I suggest you stick with the Bitstream Speedo scalable technology and delete these files from your hard disk.

The .SFP extension denotes an Agfa Intellifont PCL 4 bitmapped font. These fonts are meant to be downloaded to your PCL printer and are typically accessed by inserting escape-code sequences into your documents. Some DOS programs (FoxPro 2.5, for example) don't support scalable fonts of any kind, so downloaded printer fonts are the only way to get high-quality typefaces. If you do decide to use PCL bitmapped font with FoxPro, be prepared to customize the standard printer-driver information (stored in a file called P_Codes.dbf) yourself.—Luisa Simone

Double Your Disk Capacity!
SuperStar PRO
\$29.99 w/ Purchase of any Hard Drive
\$59.99 Separately

Best Buy Specialist for Over 18 Years

WHOLESALE TO YOU!

HARD DRIVES

SECRET SPECIAL!!
Ask...and you shall Receive!!

42MB SCSI
QUANTUM 3.5" Q42S THIRD HT. 19MS
\$89.

2.9GB FORMATTED 12MS
HITACHI DK517C-37 5.25" FULL HT./SCSI-2
\$1399!

42MB MFM 37MS
5.25" FULL HT. • IBM 665-053
\$59. FOUR \$189.

1.2GB 10MS
3.5" FULL HT. / SCSI
IBM/WD 633-H15
\$549.

328MB 12MS
5.25" HALF HT. / SCSI-2
HEWLETT PACKARD C2234
\$199.✓

107MB 15MS
3.5" THIRD HT. / IDE
SEAGATE ST3120A
\$129.

337MB 16MS
5.25" HALF HT. / SCSI
SEAGATE ST2383N
\$209.

2.1GB 13MS
5.25" FULL HT. / SCSI-D
SEAGATE ST42400ND
\$899!

127MB 17MS
3.5" THIRD HT. / SCSI
QUANTUM ELS127S
\$129.

659MB 16MS
5.25" FULL HT. / SCSI-D
HEWLETT PACKARD HP97548D
\$389.

525MB 10.5MS
3.5" HALF HT. / SCSI-2
SEAGATE ST3600N
\$318.★

330MB 16MS
5.25" FULL HT. / ESDI
HITACHI DK514-38
\$199.

867MB 12.5MS
3.5" HALF HT. / SCSI-2
TOSHIBA MK 438FB
\$499.

CONTROLLER CARDS

8 BIT XT MFM ST11M	HARD ONLY	\$15.
8 BIT XT RLL	HARD ONLY	\$22.
8 BIT SCSI	HARD ONLY	\$25.
16 BIT AT RLL	HARD ONLY	\$13.
16 BIT AT MFM	HARD ONLY	\$13.
16 BIT AT MFM	HARD / FLOPPY	\$29.
16 BIT SCSI MCS700	MICROCHANNEL	\$39.
16 BIT SCSI TMC1660	HARD ONLY	\$80.
16 BIT SCSI VESA	HARD / FLOPPY	\$89.
16 BIT SCSI DTC3280	HARD / FLOPPY	\$90.
16 BIT SCSI ALWAYS IN 2000	HARD / FLOPPY	\$125.

FLOPPY DISK DRIVES:

380K	5.25" HALF HT.	\$13.
720K	3.5" HALF HT.	\$16.
1.2MB	5.25" HALF HT.	\$29.
1.44MB	3.5" HALF HT.	\$30.

OTHER DRIVES AVAILABLE •
QUANTITY DISCOUNTS - CALL FOR A LIST!
ALL DRIVES NEW / USED OR
REFURBISHED TESTED WITH
A 90 DAY WARRANTY (OR LONGER)

CIRCLE 014 ON READER SERVICE CARD

THANK YOU!

YOU MAKE US SUCCESSFUL BECAUSE WE WORK HARDER FOR YOUR BUSINESS.



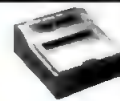
ActionMate 760 CX
 • 486-33, Active Color
 • Built-in Track Ball
 • Windows, Case, 3 yr. Warranty
 • 120 MB, 4 MB RAM
 "THE MART" **\$2450**

ActionMate
 700 Mono 210... \$1859
 700 C 120... \$2079
 700 C 210... \$2299
 700 C 260... \$2519
 700 C 310... \$2739
 700 C 360... \$2959
REMARKS:
 AccuScan/Scan System w/Kit, \$349
 ES-800 C w/Kit, \$795
 Pro 1200C... New! \$1189

POINTERS
 Stylus Color... \$559
 LX 300Stylus 800+ NEW!... \$165/\$362
 FX 8700X1170... \$219/\$345
 LP 570 Plus/1070 Plus... \$235/\$355
 LQ 870/1170... \$425/\$589
 DFX 8000/DFX 5000+... \$2189/\$1299
 AP 2250/3250... \$125/\$169
 AP 3360/LQ 2500 Color... \$189/\$879

ACTION LASER 1500
 • 600 dpi
 • 4 PPM
 • 27 Fonts
 • PCL 5
 "THE MART" **\$639**

OKIDATA



8L410E
 • 600 dpi
 • 4 PPM
 • 2 MB expandable to 5 MB
 • 12 Scalable Fonts
 "THE MART" **\$644**

NANAO
F550IW FLEXSCAN



• 17inch SVGA, NI
 • 28 Pin Flat
 • 1024/768 to 75Hz
 • 3 Year Warranty
 "THE MART" **\$985**

EDITOR'S CHOICE

TEXAS INSTRUMENTS

TM 4000N 7.5 MHz ACTIVE MATRIX COLOR!
 • Intel DX4 75 MHz
 • 8.4" C Color Screen
 • Integrated Pointing Device
 • 340 MB Hard Drive
 • NIMH Battery
 • 4000H 120 MB, MONO... \$1999
 • 4000H SL/25, 120 MB, Passive Color... \$2329
 • 4000H SL/25, 200 MB, Active Color... \$3189
 • Docking Station... \$779

ARTISOFT

Starter Kit
 Simply Lantastic-DOS #402... \$161
 Lantastic-6.0 Node Runner Si 200C... \$339
Software
 Lantastic 6.0 S User... \$371
 Lantastic 6.0 I User... \$549
 Lantastic 6.0 S User... \$1899
Cards
 Node Runner 2000A/2000T... \$215/\$169
 Node Runner 2000C... \$169
 Node Runner 2000T Si/C Si... \$77/\$77
 Node Runner 2000A Si/H Si... \$69/\$309

HEWLETT PACKARD

SCANJET HEX Color
 • 1600 DPI Resolution
 • 24 Bit Color
 • Aplus PhotoStyler SE
 "THE MART" **\$969**
SCANJET IIP Grayscale
 • 1200 DPI Resolution
 • 8 Bit 256 Grayscale
 • Aplus PhotoStyler SE
 "THE MART" **\$499**

Service is our business!

• Same day shipping on most orders placed by 3 p.m.

• All products carry manufacturer warranties

CALL "THE MART"
800-407-0700

• 24 Hour Fax Order Line: 708-967-0710

• Customer Service: 708-967-0760

• Shipping Status: 708-967-0760

• Technical Support: 708-967-0703

"THE MART" Advantage
 ✓ Corporate account specialists
 ✓ International order specialists
 ✓ Gov't orders welcome
 ✓ Knowledgeable sales staff
 ✓ No surcharge on credit cards
 ✓ Customer technical support
 ✓ Leasing options available
Order Today!

DESKTOP PCS

ASUS
 Bravo LC 4 CDROM, 170 M, MB... \$1899
 PowerLine 4 CDROM, 170 M, MB... \$2499
COMPAQ
 Proline 486 Model 340V... \$1049
 Design XL 560 Pentium Model 510V... \$3639
HP
 ALL OTHER MODELS CALL
NEC
 PowerPlus 433 DX 270 HD... \$1059
 PowerPlus 4460, 420 HD... \$1519
 ALL OTHER MODELS CALL

NOTEBOOKS

ASUS
 Bravo 4 SX/25, 120 MB... \$1399
 PowerLine 486, 340 M, MB... \$2299
COMPAQ
 Concerto 433, 220 M, MB... \$1445
HP
 SEE SPECIALS ABOVE!

IBM

ThinkPad 360CS, 4 SX/33, 170 M, MB... \$2395
 ThinkPad 755CS, 4 DX/250, 340 M, MB... \$4099

TOSHIBA

T3400 REDUCED!
 120MB MONOCHROME \$1199/\$2399
 T3400, 250 MB Cr... \$1429
 T1110 MONOCHROME... \$1449/\$2019
 T1160, 200 MB CXC/250, 340 M, MB... \$3229
 220 MB Cr... \$3229
 T4700 CT 200/320 MB... \$459/\$679

MULTIMEDIA

CD-ROM DRIVES
 CD-635 In Kit... \$345
CHINON
 Jee-Bee/486 In Kit... \$409/\$419
 4K Pro Quad... \$699
NEC
 PM-3028 In Kit... \$259/\$315
 PM-43 In Kit... \$499/\$515
SONY
 CDU-33A In Kit... \$185
TOSHIBA
 4101 In Kit... \$205/\$275
SOUND/VIDEO/SOUND BOARDS
CREATIVE
 Sound Blaster 16... \$105
 Sound Blaster VESA Pro... \$59/\$79
 Sound Blaster 16 SCSI/16 ASP/SCSI/1695/199
 AWE 32... \$265
 Windows Video Spigot... \$245
 OMNI CD Upgrade Kit Inc... \$305
 Digital Edge 3X Upgrade Kit... \$675
 Discovery 16 Inc... \$315
 Edinmont 16 Inc... \$415

ROLAND

PRO-1000
 PNC-1100... \$269
DIGITIZERS
 DrawIt 12 x 12 w/4 Button... \$215
 DB II 12 x 12 w/16 Button... \$295
 DB II 12 x 12 w/4 Button... \$585
HURTH
 XLP 12x12, 4 Button... \$210
 ALL OTHER MODELS CALL
SUMMAGRAPHICS
 Summagraphics III 12x12/2x18 Pro... \$299/\$325

MODERN

Hayes
 Accura 28.8 Fax Inc/Ext... \$362
 Accura 14.4 Fax Inc/Ext... \$123/\$145
 Optima 28.8 Fax Inc/Ext... \$359/\$419
 Optima 14.4 Fax Inc/Ext... \$349/\$369
 Ultra 14.4 Fax... \$615
Intel
 ProModem 14.4 Inc/Ext... \$119/\$139
 Satisfaction 400 Inc/Ext... \$273/\$305
 PCMCIA 14.4 Fax... \$197

PROCESSOR UPGRADES

Intel
 Over Drive 486 SX 256K 33... \$199/\$275
 Over Drive 486 DX 33... \$275

MEMORY

PC MEMORY
 ALL MODELS CALL
PRINTER MEMORY
 Canon LBP4 110/210... Call
 Epson Action Laser II 210... Call
 HP Laserjet II, III 110/210... Call
 HP Laserjet 4, 4N 210/480... Call
 NEC Silentwriter 90 210/480... Call
 Okidata all models... Call
 Panasonic all models... Call

PRINTERS

CANON
 Ink Jet
 BJC 1000... \$239
 BJC 1000E/230... \$289/\$365
 BJC 600... \$349
 LBP 430/80 Laser... \$385/\$1315

EPSON

SEE SPECIALS ABOVE!
NEWLETT
 Ink Jet
 OutLine 310 Portable... \$399
 D5-5200... \$289/\$365
 D5-1200PS... \$1438/\$2099
 Printer LX 300... \$2399
 Laserjet 4LP... \$475/\$559
 Laser Jet 40+... \$1379/\$1495
 Laserjet 4PPM+... \$1379/\$1495
 Laserjet 4PL... \$1039
 Laserjet 4SL/4PL... \$2799/\$3999

NEC

ALL MODELS CALL
OKIDATA
 Dot Matrix
 Micro Line 104 Turbo... \$215
 ML 320/321... \$259/\$415
 ML 520/521... \$349/\$489
 ML 590/591... \$409/\$559
 ML 395/395 Color... \$449/\$505
 Laser Jet 3410... \$525
 Laser Jet 3410... \$525
 OutLine 400E/410E... \$495/\$644
 OL 810/800+R/50PS... \$899/\$1079/\$1195

PANASONIC

CALL FOR LATEST PRICES
TEXAS INSTRUMENTS
 MicroHarc Ink Jet... \$275
 MicroHarc Color Ink Jet... \$509
 MicroHarc Laser... \$509
 Micro Laser Pro 23PS 65... \$1349/\$1525

PLOTTING/DIGITIZERS

COMPAQ
 DesignPlot 300S/302M... Call
 DesignPlot 300S/303M... Call
NEC
 DesignJet 600C D Size... \$699
 ALL MODELS CALL
HOUSTON INSTRUMENT
 A Business Graphics Company
 H-7100H-7200... \$1579/\$1799

ROLAND

DIGITIZERS
 DrawIt 12 x 12 w/4 Button... \$215
 DB II 12 x 12 w/16 Button... \$295
 DB II 12 x 12 w/4 Button... \$585
HURTH
 XLP 12x12, 4 Button... \$210
 ALL OTHER MODELS CALL
SUMMAGRAPHICS
 Summagraphics III 12x12/2x18 Pro... \$299/\$325

MODERN

Hayes
 Accura 28.8 Fax Inc/Ext... \$362
 Accura 14.4 Fax Inc/Ext... \$123/\$145
 Optima 28.8 Fax Inc/Ext... \$359/\$419
 Optima 14.4 Fax Inc/Ext... \$349/\$369
 Ultra 14.4 Fax... \$615
Intel
 ProModem 14.4 Inc/Ext... \$119/\$139
 Satisfaction 400 Inc/Ext... \$273/\$305
 PCMCIA 14.4 Fax... \$197

PROCESSOR UPGRADES

Intel
 Over Drive 486 SX 256K 33... \$199/\$275
 Over Drive 486 DX 33... \$275

MEMORY

PC MEMORY
 ALL MODELS CALL
PRINTER MEMORY
 Canon LBP4 110/210... Call
 Epson Action Laser II 210... Call
 HP Laserjet II, III 110/210... Call
 HP Laserjet 4, 4N 210/480... Call
 NEC Silentwriter 90 210/480... Call
 Okidata all models... Call
 Panasonic all models... Call

PROCESSOR UPGRADES

Intel
 Over Drive 486 SX 256K 33... \$199/\$275
 Over Drive 486 DX 33... \$275

MEMORY

PC MEMORY
 ALL MODELS CALL
PRINTER MEMORY
 Canon LBP4 110/210... Call
 Epson Action Laser II 210... Call
 HP Laserjet II, III 110/210... Call
 HP Laserjet 4, 4N 210/480... Call
 NEC Silentwriter 90 210/480... Call
 Okidata all models... Call
 Panasonic all models... Call

PROCESSOR UPGRADES

Intel
 Over Drive 486 SX 256K 33... \$199/\$275
 Over Drive 486 DX 33... \$275

MEMORY

PC MEMORY
 ALL MODELS CALL
PRINTER MEMORY
 Canon LBP4 110/210... Call
 Epson Action Laser II 210... Call
 HP Laserjet II, III 110/210... Call
 HP Laserjet 4, 4N 210/480... Call
 NEC Silentwriter 90 210/480... Call
 Okidata all models... Call
 Panasonic all models... Call

NOVELL

Personal Network... \$65
 Network 2.2 S User... \$459
 Network 3.12
 S/10 User... \$569/\$1289
 S/25 User... \$1849/\$2449
 100 User... \$3399
 Network 4.01
 S/10 User CD... \$769/\$1695
 S/25 User CD... \$2579/\$3445
 WE CARRY UPGRADES TOO!

ARTISOFT

SEE SPECIALS!
Xerox
 PE3-100C P... \$289
 PE3-100T/Combo... \$265/\$289
 Parallel Port Multiplexer... \$75
 14400s Pte Modern... \$455
KIMEMINI
 KNE-2000+ 1002... \$55
 KNE-2031+ Combo... \$59

NEC

ALL MODELS CALL
OKIDATA
 Dot Matrix
 Micro Line 104 Turbo... \$215
 ML 320/321... \$259/\$415
 ML 520/521... \$349/\$489
 ML 590/591... \$409/\$559
 ML 395/395 Color... \$449/\$505
 Laser Jet 3410... \$525
 Laser Jet 3410... \$525
 OutLine 400E/410E... \$495/\$644
 OL 810/800+R/50PS... \$899/\$1079/\$1195

PANASONIC

CALL FOR LATEST PRICES
TEXAS INSTRUMENTS
 MicroHarc Ink Jet... \$275
 MicroHarc Color Ink Jet... \$509
 MicroHarc Laser... \$509
 Micro Laser Pro 23PS 65... \$1349/\$1525

PLOTTING/DIGITIZERS

COMPAQ
 DesignPlot 300S/302M... Call
 DesignPlot 300S/303M... Call
NEC
 DesignJet 600C D Size... \$699
 ALL MODELS CALL
HOUSTON INSTRUMENT
 A Business Graphics Company
 H-7100H-7200... \$1579/\$1799

ROLAND

DIGITIZERS
 DrawIt 12 x 12 w/4 Button... \$215
 DB II 12 x 12 w/16 Button... \$295
 DB II 12 x 12 w/4 Button... \$585
HURTH
 XLP 12x12, 4 Button... \$210
 ALL OTHER MODELS CALL
SUMMAGRAPHICS
 Summagraphics III 12x12/2x18 Pro... \$299/\$325

MODERN

Hayes
 Accura 28.8 Fax Inc/Ext... \$362
 Accura 14.4 Fax Inc/Ext... \$123/\$145
 Optima 28.8 Fax Inc/Ext... \$359/\$419
 Optima 14.4 Fax Inc/Ext... \$349/\$369
 Ultra 14.4 Fax... \$615
Intel
 ProModem 14.4 Inc/Ext... \$119/\$139
 Satisfaction 400 Inc/Ext... \$273/\$305
 PCMCIA 14.4 Fax... \$197

PROCESSOR UPGRADES

Intel
 Over Drive 486 SX 256K 33... \$199/\$275
 Over Drive 486 DX 33... \$275

MEMORY

PC MEMORY
 ALL MODELS CALL
PRINTER MEMORY
 Canon LBP4 110/210... Call
 Epson Action Laser II 210... Call
 HP Laserjet II, III 110/210... Call
 HP Laserjet 4, 4N 210/480... Call
 NEC Silentwriter 90 210/480... Call
 Okidata all models... Call
 Panasonic all models... Call

PROCESSOR UPGRADES

Intel
 Over Drive 486 SX 256K 33... \$199/\$275
 Over Drive 486 DX 33... \$275

MEMORY

PC MEMORY
 ALL MODELS CALL
PRINTER MEMORY
 Canon LBP4 110/210... Call
 Epson Action Laser II 210... Call
 HP Laserjet II, III 110/210... Call
 HP Laserjet 4, 4N 210/480... Call
 NEC Silentwriter 90 210/480... Call
 Okidata all models... Call
 Panasonic all models... Call

PROCESSOR UPGRADES

Intel
 Over Drive 486 SX 256K 33... \$199/\$275
 Over Drive 486 DX 33... \$275

MEMORY

PC MEMORY
 ALL MODELS CALL
PRINTER MEMORY
 Canon LBP4 110/210... Call
 Epson Action Laser II 210... Call
 HP Laserjet II, III 110/210... Call
 HP Laserjet 4, 4N 210/480... Call
 NEC Silentwriter 90 210/480... Call
 Okidata all models... Call
 Panasonic all models... Call

NOVELL

Personal Network... \$65
 Network 2.2 S User... \$459
 Network 3.12
 S/10 User... \$569/\$1289
 S/25 User... \$1849/\$2449
 100 User... \$3399
 Network 4.01
 S/10 User CD... \$769/\$1695
 S/25 User CD... \$2579/\$3445
 WE CARRY UPGRADES TOO!

ARTISOFT

SEE SPECIALS!
Xerox
 PE3-100C P... \$289
 PE3-100T/Combo... \$265/\$289
 Parallel Port Multiplexer... \$75
 14400s Pte Modern... \$455
KIMEMINI
 KNE-2000+ 1002... \$55
 KNE-2031+ Combo... \$59

NEC

ALL MODELS CALL
OKIDATA
 Dot Matrix
 Micro Line 104 Turbo... \$215
 ML 320/321... \$259/\$415
 ML 520/521... \$349/\$489
 ML 590/591... \$409/\$559
 ML 395/395 Color... \$449/\$505
 Laser Jet 3410... \$525
 Laser Jet 3410... \$525
 OutLine 400E/410E... \$495/\$644
 OL 810/800+R/50PS... \$899/\$1079/\$1195

PANASONIC

CALL FOR LATEST PRICES
TEXAS INSTRUMENTS
 MicroHarc Ink Jet... \$275
 MicroHarc Color Ink Jet... \$509
 MicroHarc Laser... \$509
 Micro Laser Pro 23PS 65... \$1349/\$1525

PLOTTING/DIGITIZERS

COMPAQ
 DesignPlot 300S/302M... Call
 DesignPlot 300S/303M... Call
NEC
 DesignJet 600C D Size... \$699
 ALL MODELS CALL
HOUSTON INSTRUMENT
 A Business Graphics Company
 H-7100H-7200... \$1579/\$1799

ROLAND

DIGITIZERS
 DrawIt 12 x 12 w/4 Button... \$215
 DB II 12 x 12 w/16 Button... \$295
 DB II 12 x 12 w/4 Button... \$585
HURTH
 XLP 12x12, 4 Button... \$210
 ALL OTHER MODELS CALL
SUMMAGRAPHICS
 Summagraphics III 12x12/2x18 Pro... \$299/\$325

MODERN

Hayes
 Accura 28.8 Fax Inc/Ext... \$362
 Accura 14.4 Fax Inc/Ext... \$123/\$145
 Optima 28.8 Fax Inc/Ext... \$359/\$419
 Optima 14.4 Fax Inc/Ext... \$349/\$369
 Ultra 14.4 Fax... \$615
Intel
 ProModem 14.4 Inc/Ext... \$119/\$139
 Satisfaction 400 Inc/Ext... \$273/\$305
 PCMCIA 14.4 Fax... \$197

PROCESSOR UPGRADES

Intel
 Over Drive 486 SX 256K 33... \$199/\$275
 Over Drive 486 DX 33... \$275

MEMORY

PC MEMORY
 ALL MODELS CALL
PRINTER MEMORY
 Canon LBP4 110/210... Call
 Epson Action Laser II 210... Call
 HP Laserjet II, III 110/210... Call
 HP Laserjet 4, 4N 210/480... Call
 NEC Silentwriter 90 210/480... Call
 Okidata all models... Call
 Panasonic all models... Call

PROCESSOR UPGRADES

Intel
 Over Drive 486 SX 256K 33... \$199/\$275
 Over Drive 486 DX 33... \$275

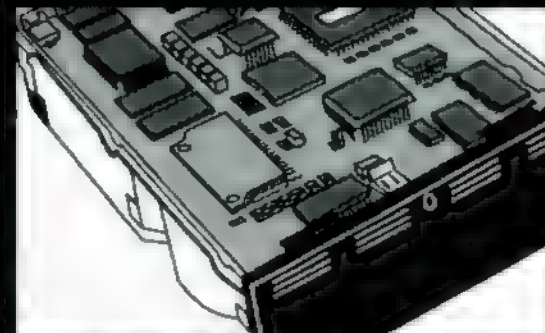
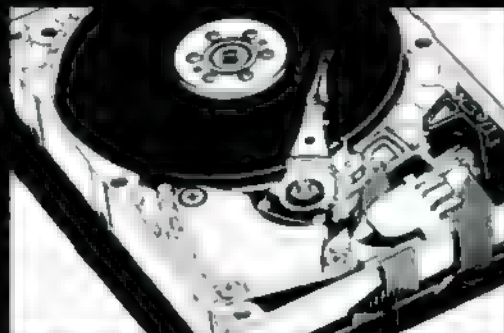
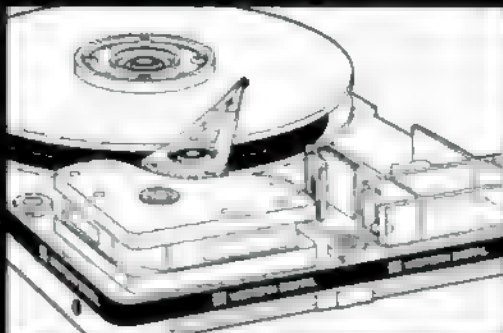
MEMORY

PC MEMORY
 ALL MODELS CALL
PRINTER MEMORY
 Canon LBP4 110/210... Call
 Epson Action Laser II 210... Call
 HP Laserjet II, III 110/210... Call
 HP Laserjet

MEGAHAUS

HARD DRIVES

The Drive Authority!



UNEQUALED REPUTATION

Nobody knows drives like MegaHaus. We have specialized in storage solutions for over 8 years. Repeat business from satisfied customers is the backbone of our business. We satisfy our customers.

DIRECT REPLACEMENT WARRANTY

During the first year of your warranty, we replace: not repair, any defective items. All items receive lifetime technical support from our factory trained techs.

SAME DAY SHIPPING

Our multi-million dollar inventory offers you the best diversity and availability in the market. We ship most orders the same day. Each order is checked at least four times for accuracy.

FAST, EASY INSTALLATION

Anyone can sell you a hard drive. We sell easy to install storage solutions. We spend countless hours researching the best solutions, then create our quick precise installation guides for each kit.

UNBEATABLE DEALS



WESTERN DIGITAL

#1 IDE drives. 3 year warranty, 128K read/write disk cache. MegaHaus unbeatable price!

420MB	12ms	WDAC2420	\$225
540MB	12ms	WDAC2540	\$315
730MB	10ms	WDAC2700	\$425

SyQuest

INCLUDES 1 FREE DISK!

The industry standard in removable media. 3 1/2" form factor. IDE interface, SCSI also available.

105MB	14.5ms	SQ3105A	\$229
270MB	13.5ms	SQ3270A	\$449

MICROPOLIS

Best buy large capacity drives! 5 year advanced replacement warranty. MegaHaus unbeatable price! Choose IDE or SCSI.

1050MB	8.5ms	MC4110	\$649
1740MB	10ms	MC2217	\$899

INCLUDES 1 FREE TAPE!

IOMEGA

FIVE YEAR WARRANTY!

250MB tape backup. \$10 drive discount w/ hard drive sale. Internal (mounts in 3 1/2" or 5 1/4" drive bay) \$159 External for printer port \$319 3 Pack of Preformatted DC2120 tapes \$40

Seagate

Baracuda drives, 7200rpm, 1MB buffer. FAST! MegaHaus unbeatable price! WIDE SCSI in stock.

1690MB	8ms	ST11950N	\$1249
2139MB	8ms	ST12550N	\$1329
4290MB	8ms	ST15150N	\$2389

WIDE SCSI

Includes drive (5yr warranty), controller, & cable.

	1Gig	2Gig	4Gig
PCI	\$1099	\$1729	\$2899
VESA or EISA	\$1199	\$1829	\$2999

HARD DRIVES

CONNER

IDE			
210MB	14ms	CFS210A	\$182
420MB	14ms	CFS420A	\$232
541MB	12ms	CFA540A	\$316
811MB	10ms	CFA810A	\$445
1080MB	9ms	CFP1080A	\$569

Maxtor

IDE			
170MB	15ms	7171A	\$172
540MB	12ms	7546A	\$285

MICROPOLIS

IDE			
1050MB	10ms	MC4110A	\$649
1740MB	10ms	MC2217A	\$899
SCSI			
1052MB	8.5ms	MC4110	\$649
1740MB	10ms	MC2217	\$899
3020MB	11ms	MC1936	\$1899
SCSI-AV Audio / Visual tuned drives			
1000MB	10ms	MC2210AV	\$749
1700MB	10ms	MC2217AV	\$999
3000MB	11ms	MC1936AV	\$2119

Seagate

IDE			
213MB	16ms	ST3243A	\$179
260MB	16ms	ST3290A	\$205
341MB	13ms	ST3391A	\$222
420MB	14ms	ST3491A	\$235
545MB	12ms	ST5660A	\$319
SCSI (WIDE SCSI also available)			
1690MB	8ms	ST11950N	\$1249
1700MB	9ms	ST11900N	\$1079
2145MB	8ms	ST12550N	\$1329
2148MB	9ms	ST12400N	\$1189
4290MB	9ms	ST15230N	\$2299
4290MB	8ms	ST15150N	\$2389

WESTERN DIGITAL

IDE			
341MB	12ms	AC2340	\$219
425MB	12ms	AC2420	\$225
540MB	11ms	AC2540	\$315
730MB	10ms	AC2700	\$425
1083MB	10ms	AC31000	\$575

HARD DRIVES

Quantum

IDE			
270MB	12ms	LPS270A	\$209
342MB	12ms	LPS340A	\$233
541MB	12ms	LPS540A	\$309
SCSI			
170MB	14ms	ELS170S	\$199
270MB	12ms	LPS270S	\$225
342MB	12ms	LPS340S	\$265
541MB	12ms	LPS540S	\$325
1080MB	10ms	IMP1080	\$665
1440MB	9.5ms	IMP1440S	\$850
2160MB	9.5ms	IMP2160S	\$1165

IBM

IDE			
270MB	12ms	70G8487	\$209
364MB	12ms	70G8488	\$227
527MB	12ms	70G8486	\$322
728MB	12ms	70G8511	\$399
1052MB	8.6ms	70G8512	\$699
SCSI			
270MB	12ms	94G2439	\$220
364MB	12ms	94G2440	\$239
527MB	12ms	94G2441	\$339
728MB	12ms	94G2422	\$449
1052MB	8.6ms	70G8492	\$679
2040MB	9.2ms	70G8493	\$1199
4250MB	11ms	90F0780	\$2239

SYQUEST

SCSI			
44/88MB	SQ5110C	\$269	\$439
105MB	SQ3105S	\$239	\$399
200MB	SQ5200C	\$399	\$599
270MB	SQ3270S	\$429	\$569
PRINTER PORT EXTERNAL (IDE)			
105MB	\$399	270MB	\$619
CARTRIDGES Qty 1 / 5 or with drive			
44MB \$66/61	88MB \$99/91	105MB \$65/61	200MB \$116/107
		270MB	\$93/89

MISCELLANEOUS

Macintosh Drives Hard Disk Cards
PCMCIA drives Floppy Drives
IBM PS/1, PS/2, and Tandy Drive upgrades

SCSI CD ROM DRIVES

NEC	CDR900	4X	180ms	\$939
NEC	CDR510	3X	195ms	\$345
Plextor	PX43CH	4X	150ms	\$475
Toshiba	XM3401	2X	200ms	\$269
Toshiba	XM4101	2X	320ms	\$215
Teac	CD50	2X	265ms	\$209
Media Vis.	SH93R	2X	280ms	\$159
HOT DEAL, Macintosh external \$255				
Pioneer External CD Changers (300ms)				
DRM602X	6 disc	307KB/sec		\$699
DRM604X	6 disc	612KB/sec		\$1049
DRM1804X	18 disc	612KB/sec		\$2079

MULTIMEDIA KITS

SCSI Drive, sound card (in retail pkg)				
PREM=Media Vision Premium 3D. PRO=Media Vision Pro 3D				
SB=Sound Blaster 16 SCSI. SA=Sound Blaster SCSI ASP.				
	PREM	PRO	SB	SA
SH93R	\$309	\$445	\$309	\$379
XM4101	\$365	\$489	\$359	\$425
CD50	\$359	\$485	\$359	\$425
XM3401	\$425	\$549	\$425	\$479
CDR510	\$499	\$619	\$499	\$559
PX43CH	\$659	\$779	\$659	\$699
CDR900	\$1129	\$1249	\$1129	\$1189

CONTROLLER CARDS

ADAPTEC		Alone	w/Drive
A1522BASIC 16Bit SCSI	\$119	\$109	
A1542CBASIC 16Bit SCSI	\$225	\$215	
A2742 EISA SCSI	\$319	\$309	
A2842 VESA SCSI	\$279	\$269	
FUTURE DOMAIN			
1680SVP 16Bit SCSI	\$155	\$139	
QLOGIC PCI SCSI & WIDE	\$325	\$309	
PCI 4IDE, incl CD ROM & FAST ATA	\$59	\$49	
ALPHA RESEARCH CACHING CARDS			
S425I 16Bit IDE	\$99	\$89	
S475I 32Bit Local Bus IDE	\$139	\$129	
S485I 32Bit PCI IDE	\$229	\$219	
S425S 16Bit SCSI	\$229	\$219	
S475S 32Bit Local Bus SCSI	\$369	\$359	
GSI 16Bit IDE accelerators (enhanced IDE)			
1533-21 2IDE, 4 Floppy	\$65	\$55	
1533-32 2IDE, 4 Floppy, IO	\$129	\$109	
4C 16Bit supports 8 IDE	\$139	\$119	
Many other types of controllers in stock.			

SCSI TAPE DRIVES

Kit includes 16bit card, DOS or Windows software & 1 tape.				
250MB	Conner	C2150	\$349	\$569
525MB	Conner	C2525	\$489	\$699
580MB	Teac	MT01F	\$399	\$599
750-LSGig	Exabyte	2501	\$499	\$699
2Gig	Conner	4320	\$749	\$899
2Gig	HP	35470	\$889	\$999
4-8Gig	Conner	4324	\$999	\$1109
4-8Gig	HP	35480	\$989	\$1099
4-16Gig	Sony	SDT5000	\$1029	\$1169
4-16Gig	Conner	4326	\$999	\$1139
4-16Gig	HP	C1533A	\$1379	\$1579
NovaBack backup software for SCSI				
Novell NLM 50 user			\$229	
Novell NLM unlimited user			\$389	
NovaBack OS/2			\$89	
NovaBack Macintosh			\$109	

SMART STORAGE SOLUTIONS

Smart Storage Solutions manufactures quality storage upgrades, and offers them at aggressive prices. All products include toll free support!

OPTICAL DRIVES

High quality, high performance optical drive solutions include 1 disk. Ask for your free "Dare to Compare" fax.

	128MB	230MB	1.3Gig
Internal upgrade	\$679	\$879	\$2209
Internal Kit	\$769	\$969	\$2299
External for Mac	\$699	\$899	\$2269

Other configurations available.

CD ROM DRIVE TOWERS

Multiple CD ROM drives in a single external enclosure. Great for networks, BBS, or business.

	2 Drive	4 Drive	7 Drive
Media Vis. 93R	\$429	\$939	\$1539
Toshiba 4101	\$569	\$1199	\$1999
Teac CD50	\$569	\$1199	\$1999
Toshiba 3401	\$669	\$1499	\$2499
NEC 3X	\$859	\$1829	\$3099
Plexstor 4X	\$1089	\$2529	\$4299
Nec 4X	\$2119	\$4339	\$7489

Other configurations available.

MEGAHAUS

HARD DRIVES

1110 NASA Rd 1 #306
Houston, Texas 77058

1-800-786-1182

Ad. Code # PA92 Sales Hours (Central Standard Time)
8am - 7pm Monday thru Friday 9am - 3pm Saturday

FAX (713) 333-3024 Local (713) 333-1910

We sell within the United States, its territories, and Canada (sorry no international orders)

CIRCLE 018 ON READER SERVICE CARD



NO SURCHARGE

We accept Fortune 500 & Government bids & PO's. We check for COD and Credit Card fraud!

Prices & specifications subject to change without notice. Shipping charges are extra. Returns must be in new condition and in original packaging. Defective items may not be returned. No refund on software or special orders (items not listed in ad). All trademarks subject to 10% restocking fee. Some exceptions may apply to wholesale deals. All trademarks are registered trademarks of their respective companies. Personal checks held for clearance. We reserve the right to refuse any sale for any reason. ©1994 MegaHaus Inc.

WE WILL TRY TO MATCH OR BEAT ANY ADVERTISED PRICE. CALL FOR LATEST PRICING!!

WE ACCEPT PO'S
FROM QUALIFIED FIRMS

M E M O R Y

NO SURCHARGE
FOR MC, VISA AE & DISCOVER

CACHE MEMORY

	128K	1024K	2048K	2560K
8Kx8	10.00	8.00	6.00	5.00
32Kx8 (2.3V)	10.00	8.00	6.00	5.00
64Kx16	11.00	9.00	7.00	6.00
64Kx32	11.00	9.00	7.00	6.00
128Kx16	11.00	9.00	7.00	6.00
128Kx32	11.00	9.00	7.00	6.00

Individual D-RAM Chips

MEMORY FOR IBM & APPLE	128K	1024K	2048K	2560K
1Mx16	8.00	6.00	5.00	4.00
1Mx32 (2.3V)	8.00	6.00	5.00	4.00
2Mx16 (2.3V)	7.25	6.75	5.00	4.00
2Mx32 (2.3V)	7.25	6.75	5.00	4.00
2Mx16 (2.3V)	7.25	6.75	5.00	4.00
2Mx32 (2.3V)	7.25	6.75	5.00	4.00
2Mx16 (2.3V)	7.25	6.75	5.00	4.00
2Mx32 (2.3V)	7.25	6.75	5.00	4.00
2Mx16 (2.3V)	7.25	6.75	5.00	4.00
2Mx32 (2.3V)	7.25	6.75	5.00	4.00

INTEL Math Chips

MEMORY FOR IBM & APPLE	128K	1024K	2048K	2560K
1Mx16	8.00	6.00	5.00	4.00
1Mx32 (2.3V)	8.00	6.00	5.00	4.00
2Mx16 (2.3V)	7.25	6.75	5.00	4.00
2Mx32 (2.3V)	7.25	6.75	5.00	4.00
2Mx16 (2.3V)	7.25	6.75	5.00	4.00
2Mx32 (2.3V)	7.25	6.75	5.00	4.00
2Mx16 (2.3V)	7.25	6.75	5.00	4.00
2Mx32 (2.3V)	7.25	6.75	5.00	4.00
2Mx16 (2.3V)	7.25	6.75	5.00	4.00
2Mx32 (2.3V)	7.25	6.75	5.00	4.00

AMBRA

Ambra Pentium-60	4.8/16 Mhz	175.00/139.00
Ambra K-4255L	2.4/8 Mhz	109.00/209.00
Ambra V Series	4.8/12/16 Mhz	109.00/209.00
Ambra SX Series	4.8/16 Mhz	189.00/229.00
Ambra Sprint SL II	2/8 Mhz	89.00/119.00

CYRIX DRX 386 to 486 Upgrade

Single chip upgrade solution	CX486 DRX-16/32	264.00
Complete turnkey solution	CX486 DRX-20/40	274.00
Complete turnkey solution	CX486 DRX-25/50	314.00
Complete turnkey solution	CX486 DRX-33/66	354.00
Complete turnkey solution	CX486 DRX-33/66	354.00
Complete turnkey solution	CX486 DRX-33/66	354.00
Complete turnkey solution	CX486 DRX-33/66	354.00
Complete turnkey solution	CX486 DRX-33/66	354.00
Complete turnkey solution	CX486 DRX-33/66	354.00
Complete turnkey solution	CX486 DRX-33/66	354.00

SIMM MODULES (Add \$5.00 for SIPP)

1Mx9 x 9 (3 chip)	49.00	44.00	43.00	41.50
1Mx9 x 9 (9 chip)	49.00	44.00	43.00	41.50
4Mx9 x 9	182.00	158.00	149.00	-
16Mx9 x 9 (9 chip)	679.00	-	-	-

72 PIN SIMMS (EISA)

256 x 36 1 mg	-	-	96.00	59.00
512 x 36 2 mg	-	-	184.00	174.00
1 mg x 36 4 mg	-	-	359.00	339.00
4 x 36 16 mg	-	-	689.00	669.00
8 x 36 32 mg	-	-	1459.00	1419.00
16 x 36 64 mg	-	-	2899.00	2749.00
32 x 36 128 mg	-	-	5799.00	5499.00
64 x 36 256 mg	-	-	11599.00	10999.00
128 x 36 512 mg	-	-	23199.00	21999.00

CYRIX FASMATH PROCESSOR

Programs executed up to 3X faster + Plug & object code compat. w/Intel	83047-40MHz - 79.00	83047-33MHz - 69.00	83047-25MHz - 59.00
3 Year Warranty - "All Downside Compatible"	-	-	-

AST MEMORY

MODEL	AMT. UPGRADED	AST PART #	PRICE
Breve LC 4/25S, 4/33, 4/33S, 4/40S, 4/46S	4Mhz	500707-002	160.00
	8Mhz	500707-003	320.00
	16Mhz	500707-004	640.00
	32Mhz	500707-005	1280.00
Premium 486/25, 25S, 33, 33S	4Mhz	500780-001	280.00
	8Mhz	500780-002	560.00
	16Mhz	500780-003	1120.00
	32Mhz	500780-004	2240.00
Premium 386/25, 33, 33S	4Mhz	500780-001	280.00
	8Mhz	500780-002	560.00
	16Mhz	500780-003	1120.00
	32Mhz	500780-004	2240.00
Premium 386/25, 33, 33S	4Mhz	500780-001	280.00
	8Mhz	500780-002	560.00
	16Mhz	500780-003	1120.00
	32Mhz	500780-004	2240.00
Premium 386/25, 33, 33S	4Mhz	500780-001	280.00
	8Mhz	500780-002	560.00
	16Mhz	500780-003	1120.00
	32Mhz	500780-004	2240.00

ZENITH MEMORY MODULES

MODEL	AMT. UPGRADED	AST PART #	PRICE
286/33 25, 20, 33E	4Mhz	ZAS3007M	50.00
286/33 25, 20, 33E, 486/25E	4Mhz	ZAS3007M	180.00
286/33 25, 20, 33E, 486/25E	4Mhz	ZAS3007M	180.00

MAGNAVOX

286/386SX-16, 386SX-20, 486SX-20 & 386-33 all are 72PIN SIMM	1MEG - 59.00	4MEG - 180.00	8MEG - 349.00	16MEG - 650.00
--	--------------	---------------	---------------	----------------

MEMORY BOARDS

16 BIT MEMORY BD FOR 286, 386 AT - OK 640K 4.0 LHM COMPAT - NEW 5 1/2" W/ 16MB EXPAND - EXTEND MEMORY - SUPPORTS DOS, OS/2, LHM/EMS & EEMS - Versatile Slot Addressing - Operates w/ CPU Speeds to 33 Mhz - Supports Desqview - Multitask operations - Bid. made by Boca Research, AT plus	OK - 344.00	2Mhz - 319.00	4Mhz - 329.00	8Mhz - 339.00
--	-------------	---------------	---------------	---------------

BOCA XT 8 BIT BUS

Expanded memory for XT + Lim 4.0 compat. 0-2Mhz + Uses 256K-100	D-K - 399.00	1Mhz - 1199.00	2Mhz - 2299.00
---	--------------	----------------	----------------

IBM P/52 32BIT EXPANSION BD.

0-16Mhz, Ext. Expand Memory Bd for P/52 70 80 90, Lim 4.0	0Mhz	2Mhz	4Mhz	8Mhz	16Mhz
	\$139.00	\$234.00	\$319.00	\$499.00	\$869.00

PS/2 MCA 0-8MEG EXPANSION BD.

0-8Mhz Extended and/or Expanded Memory for all IBM P/52 Models 50, 50Z, 60, 55SX, 65SX, 16 bit, 4.0 LHM Compat.	OK - 119.00	2Mhz - 199.00	4Mhz - 289.00	8Mhz - 449.00
---	-------------	---------------	---------------	---------------

CHANGE YOUR 286 TO A 486

* Features IBM 486 SX/2 Processor Clock	286 CPU	PLCC (Type)	25/50 Mhz	279.00
* Doubles (25/50 or 33/66) 16K of Internal Cache	286 CPU	PGA (Type)	25/50 Mhz	279.00

IBM PS/1, PS/2 MEMORY MODULES

MODEL	AMT. UPGRADED	MODEL	PRICE
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00

IBM NOTEBOOK & LAPTOP MEMORY

MODEL	AMT. UPGRADED	MODEL	PRICE
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00

COMPAQ MEMORY MODULES

MODEL	AMT. UPGRADED	MODEL	PRICE
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00

COMPAQ LAPTOPS & NOTEBOOKS

MODEL	AMT. UPGRADED	MODEL	PRICE
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00

TOSHIBA LAPTOP MEMORY

MODEL	AMT. UPGRADED	MODEL	PRICE
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00

NOTEBOOK, LAPTOP MEMORY

MODEL	AMT. UPGRADED	MODEL	PRICE
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00

PCMCIA VERSION 2.0

MODEL	AMT. UPGRADED	MODEL	PRICE
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00
286/33 25, 20, 33E	4Mhz	286/33 25, 20, 33E	179.00

LASER PRINTER MEMORY UPGRADES

Flashmaster Card	100 00	105-M4 Type III Hard Drive	CALL
FLASHMASTER 2 Mhz-290.00	5 Mhz-357.00	10Mhz 555.00	20Mhz 909.00
Flash-Master is the only hard disk controller on a hard disk drive. It's a Diskmaster, because your system will use the Flash-Master's 100 to C hard disk drive and it's a 40-pin ribbon drive. It's a 40-pin ribbon drive. It's a 40-pin ribbon drive.			
Flashmaster is the only hard disk controller on a hard disk drive. It's a Diskmaster, because your system will use the Flash-Master's 100 to C hard disk drive and it's a 40-pin ribbon drive. It's a 40-pin ribbon drive. It's a 40-pin ribbon drive.			

LASER PRINTER MEMORY UPGRADES

AMOUNT UPGRADED	0M 00	250K	1	2	3	3.5	4	5	6	8	16	32
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43												
Zany 40 43							</					

FLORIDA'S LARGEST AUTHORIZED DEALER FOR NOTEBOOK COMPUTERS

DIRECT!!



TOSHIBA

T3600 Portégé
AUTHORIZED DEALER

- T3400 Mono \$1299
- T3400 CT Active 120HD \$2699
- T3400CT 250HD CALL
- T3600 CT \$4099

ALL MODELS IN STOCK

TOSHIBA

T1910/T1960CT
AUTHORIZED DEALER

- T1910 Mono 200 \$1479
- T1910CS 200 Color \$1999
- T1960CS 200 Color \$2399
- T1960CT 200 \$2999
- T1960CT 320 \$3299

ALL MODELS IN STOCK

TOSHIBA

T4700CT / T4800CT
AUTHORIZED DEALER

- T4700CS/200 Color
- T4700CS/320 Color
- T4700CT/200 Active Color
- T4700CT/320 Active Color
- T4800CT/510 Active Color
- In Stock

CALL FOR BEST PRICE

TOSHIBA

T2400CT

- T2400CS
- DX50 4/250 DUAL \$2949
- T2400CT 4/250 \$3675
- DX50 4/320 ACTIVE \$3849

ALL MODELS IN STOCK

NEW

COMPAQ

CANTURA AERO
AUTHORIZED DEALER

- 486/25 Mono 84 \$899
- 486/25 Mono 120 \$1249
- 486/33 Color 170 \$1849
- 486/33 Color 250 \$2139

ALL MODELS IN STOCK

COMPAQ NEW

LTE ELITE 486/40, 50, 75MHz
AUTHORIZED DEALER

- 486DX40/50/75MHz 340 Meg HD
- 170 Meg HD 510 Meg HD
- VGA ACTIVE MATRIX COLOR • IN STOCK

CALL FOR BEST PRICE

EPSON

ACTION NOTE 700 486DX/33

- 700 120 MEG \$1749
- 700 170 MEG \$1799
- 700C 120 MEG \$2289
- 700C 170 MEG \$2389
- 700CX 120 MEG \$2869
- 700CX 170 MEG \$2999

- W/Fax, Modem & Case
- 260 HARD DRIVE CALL

ALL MODELS IN STOCK

NEC

VERSA E
AUTHORIZED DEALER

- 486DX40 120 \$3389 Active Color
- 486DX40 250 \$3635 Active Color
- 486DX50 209 \$3695 Active Color
- 486DX50 340 \$3995 Active Color
- 486DX75 340 \$4215 Active Color
- 486DX75 540 \$5199 Active Color
- 486DX100 CALL
- VERSA S / 33 & 50 CALL

- 486DX40 4/250 Color Pen \$4249
- 486DX50 4/340 Color Pen \$5035

ALL MODELS IN STOCK

HIGH END NETWORK SERVERS

IBM AST.

NEC
COMPAQ
PROLIANT

1000R • 2000R
4000R

All Servers In Stock

AST

ASCENTIA 900N
AUTHORIZED DEALER

- DX50 4/250 Dual \$2899
- DX50 4/340 Dual \$3249
- DX50 8/340 Active \$4749
- DX75 8/340 Dual \$3879
- DX75 8/510 Active \$6249

ALL MODELS IN STOCK

TEXAS INSTRUMENTS

MULTI MEDIA READY
TRAVELMATE TM 4000M

- SX/25 Mono \$1865
- SX/25 Color \$2119
- SX/25 Active Color \$2969
- DX4/75 Active Color \$4999

ALL MODELS IN STOCK

IBM

THINKPAD 360

- 360 Mono \$1999
- 360CS Color \$2599
- 360C Active Color \$3499

ALL ITEMS IN STOCK

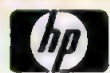
NEW

IBM

THINKPAD 755C

- 755CS Color
- 755C Active Color
- All In Stock

CALL FOR BEST PRICE



HEWLETT
PACKARD
Authorized Dealer



- HP4L \$629
- HP4P \$929
- HP4ML \$969
- HP520 \$279
- HP4MP \$1299
- HP100LX \$479
- HP1200C \$1299
- HP1200CPS \$2198
- HP560C \$544
- HP Fax 900 \$749
- HP Fax 950 \$927
- HP Deskjet 310 \$289
- HP Scanjet 2CX \$949
- HP Scanjet 2P \$499
- HP Omnibook 530 CALL
- ALL MODELS IN STOCK

22191 POWERLINE RD., SUITE 14B, BOCA RATON, FL 33433

FOR TECH SUPPORT &
CUSTOMER SERVICE

FAX YOUR ORDER

OUTSIDE USA

(407) 394-3742 (407) 750-4261 (407) 394-4180

WHEN IN FLORIDA VISIT OUR
5000 SQ. FT. SHOWROOM

- TECH HOURS MON-FRI 9-6, SAT 10-4
- COMPANY & GOVERNMENT PURCHASE ORDERS WELCOME
- NO CREDIT CARD SURCHARGE
- WE ACCEPT VISA, MASTERCARD, DISCOVER & AMERICAN EXPRESS
- WE ARE OPEN MON-FRI 9am-8pm SATURDAY 10am-6pm SUNDAY Closed

ATTENTION:

THE FOLLOWING ALSO APPLIES

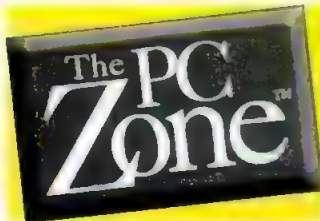
- ALL ITEMS CARRY A ONE YEAR WARRANTY
- 15-DAY RETURN POLICY
- ALL ITEMS RETURNED MUST INCLUDE ORIGINAL PACKAGING AND DOCUMENTATION
- NO RETURNS WITHOUT RMA NUMBER
- SHIPPING AND HANDLING NON REFUNDABLE
- ALL RETURNS SUBJECT TO A RE-STOCKING FEE
- NOT RESPONSIBLE FOR TYPOGRAPHICAL ERRORS
- SOFTWARE NOT RETURNABLE
- LASER PRINTERS NOT RETURNABLE

CIRCLE 081 ON READER SERVICE CARD



SUNSHINE
COMPUTERS

1-800-413-5854



WHERE AMERICA'S BUSINESSES SHOP

BRAND NAMES.

SupraExpress 14.4i Internal FAXModem for Windows

◆ 14,400 send/receive data/fax modem **\$79**

The SupraExpress 14.4i Internal FaxModem is a 1/2 card for Windows users on IBM PC & compatible computers and comes with everything you need to get started: fax software, cables, manuals, and a free subscription to on-line services. It offers a complete data/fax solution and carries a five-year manufacturer's limited warranty. Supra **W#15748**



HP DeskJet 560C Inkjet Color Printer

◆ 600x300 dpi with HP's Resolution Enhancement Technology **\$589**

The HP DeskJet 560C Inkjet Printer provides advanced color printing through ColorSmart technology and 600x300 dpi resolution. It prints on plain, special or glossy paper, transparencies and envelopes. And comes with a 3-year warranty for affordable, high-quality printing for years to come. Hewlett-Packard **#13686**

D09944 Abacadata Design Your Own Railroad... \$32.98

Adobe

B13024 Acrobat Personal Distiller... \$449.98
B13021 Acrobat Starter Kit... \$658.98
W10791 Illustrator 4.0 w/Streamline 3.0... \$429.98
W17200 Photoshop 2.5 1 Win. KTP Photodisc... \$549.98
W12582 Photoshop 2.5/Illustrator/8... \$599.98

Aldus

W07215 Aldus FreeHand 3 11 Win... \$360.98
W17248 Aldus FreeHand 3 11 Win V/U... \$139.98
W09058 Aldus PageMaker 5.0 Win... \$559.98
W13204 Aldus PageMaker 5.0 Single user Lic Pk... \$438.98
W12582 Aldus PageMaker 5.0 V/U... \$139.98
W17240 TouchBase 1.0 Win/Quicken 3.0... \$44.98

W13495 Allegro Clinton Health Security Plan... \$12.98
B97164 Amer S/W Phone Disc USA Bz... \$48.98

American Training

W13927 Barbie PC Fashion Design & Color... \$18.98
W13928 Creature Maker... \$18.98
W14109 Teach Me Excel 4.0 Win/World Win... \$26.98
W14112 Teach Me Lotus 1-2-3 v. 3.4... \$26.98
W14108 Teach Me MS DOS 5 Win 3.1/PC386-486... \$24.98
W14113 Teach Me Win 3.1... \$24.98
W14114 Teach Me WordPerfect 5.2 Win... \$24.98
W14848 The Computer Carnival... \$24.98
W13929 The Great Computer Adventure... \$24.98

W13201 Arabesque ECCO Pro 2.0... \$179.98
W13245 Arabesque ECCO Simplicity 2.0... \$68.98
W14425 Ares FontChameleon and FontMinder/85144... \$48.98
W14419 Autodesk AutoCAD LT Win... \$448.98
D07617 Autodesk Generic CADD 6.1... \$288.98
W11335 Avantis ManagePro 2.0 Win... \$229.98

BERKELLEY

W07787 After Dark 2.0 Win... \$27.98
W13701 The Disney Collection Sci. Swr... \$27.98

Borland

W07326 Borland C++ 4.0... \$336.98
W13991 Borland C++ 4.0 CD-ROM Spec./U... \$186.98
W11507 Borland C++ 4.0 Special/U... \$186.98
W13989 Borland Visual Solutions Pk... \$92.98
D12414 dBASE 5.0 DOS... \$514.98
D12400 dBASE 5.0 DOS V/U... \$144.98
W15787 dBASE Win... \$329.98
W15794 dBASE Win V/U... \$189.98
W11872 Paradox 4.5 Win... \$138.98

Canoe

W12309 OmniPage Direct Win 2.0... \$98.98
W09785 OmniPage Pro 5.0 Win... \$498.98

Clarix

Lotus 123 Release 5
W12397 \$94
UPGRADE
New Version!

W13575 Clans Works Win w/Fax Works... \$58.98
W11328 Filemaker Pro 2.1 Win... \$114.98
W11722 Filemaker Pro 2.1 Trade Up... \$88.98

Corel

W15685 Corel CD PowerPak... \$34.98
W16032 Corel GALLERY... \$34.98
W15650 Corel VENTURA 4.2 Win CD-ROM... \$134.98
W16009 CorelDRAW 3 CD... \$99.98
W17212 CorelDRAW 3 to 5/U CD & Disk... \$418.98
W17211 CorelDRAW 3 to 5/U CD only... \$324.98
W12556 CorelDRAW 4 Win... \$388.98
W12581 CorelDRAW 4 Win V/U... \$228.98
W13211 CorelDRAW 4 Win V/U CD only... \$138.98
W17210 CorelDRAW 4 to 5/U CD & Disk... \$229.98
W17209 CorelDRAW 4 to 5/U CD & Wacom ArtZ... \$464.98
W16038 CorelDRAW 4 to 5/U CD only... \$178.98
W16037 CorelDRAW 5 CD-ROM only... \$469.98
W12583 CorelSCSI 2 DOS, Win, and OS/2... \$89.98

D08149 Datasorm Precomm Plus 2 01... \$69.98
W11145 Datasorm PreComm Plus Win... \$34.98
W13704 Datanix Conversions Plus Win... \$92.98
W09577 Delrina WinFax Pro 4.0... \$89.98
W12898 DesignCAD 20 Win 7.0... \$174.98
D07100 Digital Dir. Phone Disc Residential... \$48.98
W07100 Digital Dir. Phone Disc Reverse... \$148.98
W13926 Elseware Font Works... \$79.98
W13941 Faure Matisse 1.25... \$98.98
W14492 Firefly PhotoGenix Pro Ed... \$129.98
W07475 Fractal Design Painter 2.0 Win... \$258.98
W11100 FrameMaker 4 Win... \$579.98

Microsoft Office 4.2
W12153 \$265
Competitive & Version Upgrade!

W15655 HSC Kai's Power Tools 2 0 Win... \$114.98
B05438 Hyperplot Beritz Think & Talk French CD-ROM... \$122.98
B05439 Hyperplot Beritz Think & Talk Spanish CD-ROM... \$122.98

W14753 OS/2 2.1 Win... \$45.98
W14754 OS/2 2.1 Win CD Ver... \$35.98
W13955 IdeaFisher Win... \$94.98
W15967 Imageware ImageWizard... \$89.98
W15968 Imageware Morph Wizard... \$89.98
W13917 MSI The Art of Business... \$144.98
W07857 Insert HLaak Pro Win 2.0... \$79.98
W14763 Iterated Images Inc. w/Fractal Vid. Clip \$139.98
D09446 Jan Biz Plan Builder... \$78.98
W14277 Leister Reunion - The Family Tree Win... \$84.98

W13366 CC-Mail 10 User Pk 4.0... \$225.00
D09854 CC-Mail DOS Platform Pk 4.0... \$190.00
W12499 CC-Mail Win Plat Pk Quick Ref Set... \$98.98
W09853 CC-Mail Win Platform Pk 2.0... \$324.00
W15303 CC-Mail Gp Pk DOSWIN 10-User 2.0... \$569.98
D07203 CC-Mail Remote 3.3 1 (DOS)... \$149.98
W07430 FreeLance 2 01 Win V/Comp/U... \$94.98
W07164 FreeLance Win 2 01... \$330.98
D09581 FreeLance Graph 4 0 20133... \$328.98
W16657 Improv 2 1 License Pk... \$85.98
W16656 Improv Win 2 1... \$95.98
D07885 Lotus 123 2 4 DOS... \$332.98
D11059 Lotus 123 2 4/U... \$98.98
D11988 Lotus 123 2 4/U Lic Pk... \$84.98
D09582 Lotus 123 3 4a... \$395.98
D07149 Lotus 123 3 4A/090627... \$93.98
W09658 Lotus 123 Win 1 0 12562... \$308.98
W11342 Lotus 123 Win 1 1 Server... \$365.98
W12397 Lotus 123 Rel 4 01 Win V/Comp/U... \$94.98
W12395 Lotus 123 Rel 4 01 Win... \$292.98
W12497 Lotus 123 Rel 4 Win Lic Pk... \$245.98
W11998 Lotus Ami Pro 3 0/U Lic... \$58.00
W09557 Lotus Ami Pro 3 0 1 Win... \$240.98
W15332 Lotus Ami Pro R3 D1 Comp/U... \$94.98
W13570 Lotus Approach 2 1 Win... \$94.98
D09894 Lotus FreeLance 4 Comp/U 90523... \$98.98
W13564 Lotus Improv 2.1... \$310.98
W13772 Lotus Notes 3 0 Server... \$409.98
D13583 Lotus Notes OS/2 Client... \$408.98
W13581 Lotus Notes Win Client 3.0... \$408.98
W11193 Lotus Organizer Win 1.1... \$94.98
W12406 SmartSuite 2.1... \$448.98
W13869 SmartSuite 2.1 Doc Pk... \$103.98
W12408 SmartSuite 2.1 V/Comp/U... \$280.00

W12866 Director 3.1 Player Win... \$718.98
W99514 Dir. 3.1 3 w/Dir 3.1 Player Win... \$1,248.00
W15786 Meca Managing Your Money Win 1.0... \$34.98

W14036 Publisher's Paradise Pro CD-ROM... \$34.98
W14443 ABC Flowchart Win 3.0... \$298.98
W13793 Designer 4.0... \$458.98
W14841 Microhelp Uninstaller 2... \$38.98
W11642 WFW 3 11 (Win for Wrtgpr)... \$131.98
W11645 WFW 3 11 Add-on Win 3 1 User... \$42.98
W11770 WFW 3 11 Intro to Networking... \$29.98
W11643 WFW 3 11 MLP Lic Pk... \$118.98
D12225 DOS 6 21/U... \$44.98
D12226 DOS 6 21/U... \$44.98
D12150 DOS 6 21/U 3PK... \$113.98
D13882 DOS 6 21/U Step-Up... \$9.98
W15486 Excel 5 0 Win Comp/U... \$114.98
W07893 Excel 5 0 Win V/U... \$89.98
W07875 Excel 5 0 Win... \$298.98
W11888 FoxPro 2 6 Std. Ed... \$88.98
W12413 FoxPro Win & DOS2 5-2 6 Dist. Kit... \$18.98
W12093 FoxPro Win 2.5 to 2.6/U... \$18.98
D16370 FoxPro 2.6 DOS Lic Pk... \$79.98
D12091 FoxPro 2.6 DOS... \$88.98
D16368 FoxPro 2.6 Pro DOS... \$442.98
W16366 FoxPro 2.6 Pro Win... \$442.98
W16367 FoxPro 2.6 Pro Win/Any... \$268.98
D16369 FoxPro 2.6 Pro V/U DOS... \$278.98
D12096 FoxPro V/U from 2.5 to 2.6 DOS... \$18.98
W13552 Office 4 2 Win Pro... \$559.98
W16352 Office 4 2 Win/U on CD ROM... \$265.98
W12153 Office 4 2 Win V/Comp/U... \$265.98
W10564 Office 4 2 Win... \$494.98
W13060 Office 4 2 Win CD ROM... \$454.98
W11174 Office 4 3 Pro MLP 1 User... \$459.98
W17833 Office 4 3 Pro MLP/U 1 User... \$333.98
W17831 Office 4 3 Pro V/Comp/U... \$355.98
W17832 Office 4 3 Pro CD ROM... \$353.98
W13552 Office 4 3 Pro Win... \$539.98
W17847 Office Assistant Win... \$84.98
W07209 PowerPoint 4 0 Win V/Comp/U... \$114.98
W1213 PowerPoint 4 0 Win... \$297.98
D17745 Project 4 0 DOS... \$297.98
W12157 Project 4 0 Win... \$418.98
W07847 Project 4 0 V/U Win... \$134.98
W11647 WFW 3 11 Add-on Win 3 1 Sngl M... \$36.98
W15405 WFW 3 11 Add-on Win 3 11 20 MM... \$672.98
W07752 Win 3 11... \$68.98
D08942 Word 6 0 DOS... \$314.98
W13888 Word 6 0 Win V/U... \$98.98
W09974 Word 6 0 Win... \$298.98
W07404 Word 6 0 Win Comp/U... \$108.98

QuarkXPress 3.3
W11910 \$568

W11036 Midisoft Studio 3 1 Win... \$158.98
W96919 Miramar Personal Mac/Win Connect... \$124.98
W14293 Music Ware Panel... \$89.98
B16058 NetWare 3 12 10 user 3.5... \$1,580.00
B16065 NetWare 3 12 100 user CD... \$4,300.00
B16066 NetWare 3 12 25 user 3.5... \$2,340.00
W11078 Peachtree Acctg Win 3.0... \$114.98
D11327 Peachtree Complete Acctg 7.0... \$179.98
D15976 Photodisc Picture Factory Set 1... \$38.98
W99551 Polar OneTwentyEightVol. 1... \$178.98
W11740 Photo Typesetter Win 1.1... \$184.98
B07980 Presentation Task Force 4.0... \$68.98
W14149 Pro CD Select Phone... \$179.98
W11910 QuarkXPress 3 3 Win... \$568.98
W09768 Quicken Win 3.0... \$39.98
D09707 Renaissance OEMM 386 7 03... \$59.98
B96514 Sense Interactive America... \$39.98

W14846 Sense Interactive Earth Air Fire Water... \$49.98
W11509 Shapeware Visio 2 0 Win... \$123.98
W10777 Amer Heritage Dictionary III... \$39.98
B95594 Amer Heritage Talking Dictionary CD... \$39.98
W11919 Calendar Creator Plus 2.0 Win... \$44.98
W15055 Land Designer Win... \$44.98
W15054 myHouse Win... \$44.98
B94301 Sports illus. Sports Almanac CD Win... \$39.98
W07480 SPC Harvard Graphics 2.0 Win... \$278.98
W09851 Star Electronics Stacker 4 0 Win/DOS... \$94.98
D14787 Acctg For Sm Biz LAN Std. P... \$279.98
D14782 Acctg For Sm Biz Bonus Pk... \$136.98
D14786 Acctg For Sm Biz LAN Bonus Pk... \$349.98
D14758 Acctg For Sm Biz Std. Pk... \$39.98
W10823 ACT! 2 0 Win... \$164.98
W07153 Norton AntiVirus 4 0 DOS/Win... \$78.98
W07783 Norton Desktop Top 3 0 Win... \$99.98
W10718 Norton Desktop Top 3 0/U Win... \$46.98
W07380 Norton Utilities 8 0... \$99.98
W07600 Norton Utilities 8 0/U... \$48.98
W12551 pcANYWHERE 1 0 Win... \$122.98
D07653 pcANYWHERE 4 5 Host/Remote... \$118.98

Symantec Norton Utilities 8.0
W07380 \$99
New Version!

W12895 Incredible Image Pak CD ROM... \$64.98
B14423 Studio Series Design Group CD... \$188.98
D14292 Write Pro 1/23/4... \$59.98
B11902 Three-G Images w/Impact! CD ROM... \$278.98
W13273 Timeslips 5 Win... \$194.98
W12214 Traveling S/W LapLink V (Win/DOS)... \$99.98
W12888 Virtus Walkthrough 1.1... \$118.98
W12678 Voudette Flowerscape... \$44.98

W12392 Borland Office 2 0 Win... \$360.98
W15079 Borland Office 2 0 V/U... \$222.98
W12391 Borland Office Win 2.0 Comp/U... \$274.98
D12383 WP 6 0 DOS... \$274.98
W09740 WP 6.0A Win... \$205.98
W13860 WP 6.0A V/Comp/U Win... \$74.98
D12158 WP Presentation 2 0 Comp/U... \$98.98
D11127 WP Works Add Lic Pk... \$58.98
W13877 WP 6 0 Comp Trade up Win CD-ROM... \$128.98
D16179 WP 6 0 Dos Documentation... \$31.98
D12386 WP 6 0 DOS V/U... \$98.98
W13876 WP 6 0 Win/U CD-Rom... \$94.98
W13877 WP 6 0A Win CD ROM... \$312.98
W13894 WP 6.0A Win & Quattro Pro 5.0/B... \$292.98
W13896 WP 6.0A Win & Quattro Pro 5.0/U... \$129.98
W13895 WP 6.0A Win & Quattro Pro Comp/U... \$128.98
W13872 WP 6.0A Win CD ROM... \$312.98
W10697 WP 6 0A Win Lic Pk w/DOS... \$211.98
W13876 WP 6 0A Win V/U CD ROM... \$94.98
W13373 WP Present. 2 0 Win Lic Pk w/DOS... \$398.98
W13375 WP Present. 2 0 for Win Single/U... \$78.98
W13374 WP Present. 2 0 Win Lic Pk w/DOS... \$172.98
D15496 WP Works 1.0... \$89.98

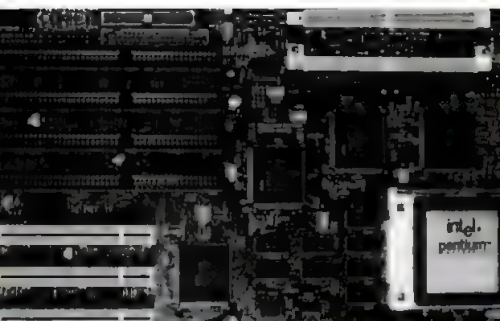
COMPATIBILITY KEY		
W=Windows	D=DOS	B=Both
UPGRADE KEY		
B = Bundle		
U = Upgrade		
V/U = Version Upgrade		
Comp/U = Competitive Upgrade		
V/Comp/U = Version Competitive Upgrade		

Knowledgeable Sales Advisors help make buying easy!



Credit cards are not charged until the order is shipped. Most products ship the same day for overnight delivery. Packages shipped overnight at \$6 for the first 7 pounds and \$1 for each additional pound or UPS at carrier's actual rate. Call for international shipping rates. Packaging and handling \$4 per order. Returns subject to a restocking fee. Prices and product availability subject to change without notice. Specials and promotions may be limited to stock on hand.

IF YOU DON'T SEE IT...CALL!



Maxtor
546MB IDE 12ms
256K Cache
Hard Drive
\$319

WESTERN DIGITAL
420MB IDE 128K
Cache, 13ms
Hard Drive
\$259

Hard Drives

What Other Hard Drive Dealer Includes EVERYTHING You need to install Your Drive?

- ✓ Frame Kit
- ✓ Cables
- ✓ Screws
- ✓ Manual

Motherboards

2 VESA SLOTS, ZIF SOCKETED, P24T PENTIUM READY, 256K CACHE EXPANDABLE, AMI BIOS, 1 YEAR WARRANTY

486SX-25	Intel CPU (VLA255XMB)	\$179
486SX-33	Intel CPU (VLA335XMB)	195
486DX-33	Cyrix CPU (CY433DXMB)	285
486DX-33	Intel CPU (VLA33DXMB)	339
486DX-40	Cyrix CPU (CY440DXMB)	295
486DX2-50	Intel CPU 256K Cache (VLA50DX2MB)	389
486DX2-66	AMD CPU (VLA66XMB)	379
486DX2-66	Intel CPU 256K Cache (VLA66XMB)	439
486DX4-100	Intel CPU 256K Cache (VLA100XMB)	789

FOR PCI/VLB MOTHERBOARD, ADD \$69

IBM 486 SLC-66MHz
66MHz Processor, AMI BIOS, 2 VESA LOCAL BUS SLOTS, 64K CACHE, 1 YEAR WARRANTY, MATH COPROCESSOR **486SLC-66** (M486SLC28)..... **\$289**

386 & 486 ISA MOTHERBOARDS

386SX-40MHz	AMD CPU (A386SX40S)	\$99
386DX-40MHz	AMD CPU 128K Cache upgradeable to any 486 (A386DX40S)	129
486SX-25MHz	Intel CPU 128K Cache upgradeable to any Intel 486 (A486SX25S)	165
486DX-33MHz	Intel CPU 128K Cache upgradeable to any Intel 486 (A486DX33S)	195
486DX-33MHz	Intel CPU 128K Cache upgradeable to any Intel 486 (A486DX33S)	339
486DX2-50MHz	Intel CPU 256K Cache upgradeable to any Intel 486 (A486DX250S)	379
486DX2-66MHz	Intel CPU 256K Cache (A486DX266S)	389

486 EISA/VESA 66MHz DX2 w/256K Cache (EMB486)..... \$499

PENTIUM MOTHERBOARDS

256K CACHE, 3 PCI SLOTS, 4 16-BIT ISA SLOTS
P5-60 MHz w/6 72-Pin SIMM Sockets (P560MB)..... **\$929**
P5-66 MHz w/6 72-Pin SIMM Sockets (P566MB)..... **1099**
P5-90 MHz w/6 72-Pin SIMM Sockets (P590MB)..... **1299**
CALL FOR OTHER P5 MOTHERBOARDS

VIDEO CARDS

16-Bit 1MB ISA Trident Chipset (V161MB)	\$55
16-Bit 256K VGA Card (P505VGA256)	30
STB Powergraph 1MB VLB or ISA (STBPGVL)	115
STB Horizon 1MB VLB or ISA (STBPGVL)	95
STB Lightspeed Tseng Labs W32P 2MB VLB (STBLSVL)	179
STB Express 1MB PCI (STBEXPCL)	115
STB Pegasus 4MB VLB 1600x1280 (PEGASUS)	595
Diamond SpeedStar Pro VLB 1MB Cirrus Chipset (SSPROVL)	97
Diamond Stealth 24VLB 1MB S3 Chipset (S24VL)	135
Diamond Stealth 64 VLB (S64VL) or PCI (S64PC)	309
Diamond Stealth 32 2MB VLB (S32VL) or PCI (S32PC) Tseng Labs 32	195
Diamond Viper 2MB VRAM Wetek Chipset VLB (VIPERVL)	315
Diamond Viper 2MB VRAM Wetek Chipset PCI (VIPERPCI)	315
Hercules Stingray 1MB VLB (H501)	99
Hercules Stingray 1MB PCI (H501)	99
Hercules Dynamite Pro VLB or ISA 1MB (H060)	129
Hercules Dynamite Pro VLB or ISA 2MB (H062)	168
Hercules Dynamite Power VLB 2MB (H072)	195
Hercules Dynamite Power PCI 2MB (H072)	195
Hercules Graphite Pro VLB or ISA 1MB (H061)	179
Hercules Graphite Pro VLB or ISA 2MB (H072)	259
Orchid Celsius 1MB VLB (C01VL)	169
Orchid Kelvin 1MB VLB (K01VL) or 1MB PCI (K01VPCI)	169
Orchid Kelvin 2MB PCI (K02VPCI)	229

Network Cards

LONGSHINE		
LCS8634MI	NE2000 Compatible 10 Base-2 16-Bit Ethernet w/BNC	\$45
LCS8634LT	NE2000 Compatible 10 Base-T 16-Bit Ethernet w/BNC	\$49
GENIUS		
GE21000	NE2000 Compatible 16-Bit Ethernet w/BNC	\$49
GE22000	NE2000 Compatible 16-Bit Ethernet Combo w/BNC RJ45, BNC	\$57
GE2000TB	NE2000 Compatible 16-Bit Ethernet w/10 Base T	\$47

DIAMOND
Computer Systems

NEW STEALTH 64
VLB or PCI
\$309

130-170MB		
Maxtor	170MB IDE 64K Cache (M171TA)	\$169
IBM	170MB IDE (H317)	175
200-350MB		
Western Digital	212MB IDE 64K Cache (WD1210A)	189
Seagate	214MB IDE 32K Cache (ST3210A)	189
Seagate	260MB IDE 64K Cache (ST3260A)	205
Maxtor	273MB IDE 256K Cache (M273TA)	209
Maxtor	290MB IDE 64K Cache (M290TA)	209
Maxtor	290MB SCSI 64K Cache (M290S)	225
Seagate	340MB IDE 256K Cache (ST3341A)	235
Western Digital	340MB IDE 128K Cache (WD340A)	229
NEC	345MB IDE Cache (H371)	219
Maxtor	345MB IDE 64K Cache (M374SA)	219
Maxtor	345MB SCSI 64K Cache (M374SS)	229
400-800MB		
Maxtor	405MB IDE 256K Cache (M405A)	239
Western Digital	420MB IDE 128K Cache (WD420A)	259
Seagate	425MB IDE 256K Cache (ST3425A)	299
Seagate	425MB SCSI 256K Cache (ST3425S)	465
Quantum	540MB IDE 128K Cache (PS540AT)	445
Seagate	540MB IDE 256K Cache (ST3555A)	369
Seagate	540MB SCSI 256K Cache (ST3555S)	460
Conner	545MB IDE 256K Cache (C545A)	339
Western Digital	540MB IDE 128K Cache (WD540A)	325
Maxtor	546MB IDE 256K Cache (M574SA)	319
Western Digital	730MB IDE 128K Cache (WD730A)	465
1000MB AND MORE		
Seagate	1050MB SCSI2 1024K Cache (ST31000S)	699
Quantum	1080MB SCSI2 512K Cache (Q1080S)	719
Western Digital	1083MB IDE 128K Cache (WD1083)	675
Seagate	1700MB SCSI2 1024K Cache (ST17000S)	1095
Seagate	1700MB SCSI2 1024K Cache (ST17000S)	1455
Quantum	1800MB SCSI2 512K Cache (Q1800S)	935
Seagate	2100MB SCSI2 1024K Cache (ST21000S)	1299
Seagate	2100MB SCSI2 1024K Cache (ST21000S)	1639
Seagate	2900MB SCSI2 512K Cache (ST43000S)	1939

486-DX2-66
VESA Motherboard
w/CPU Fan &
256K Cache
\$379

Pentium P5-60
PCI Motherboard
w/256K Cache
\$929

Modems

US ROBOTICS-SPORTSTER MODEMS	
Sportster 14400 Internal Modem (SPT14400DI)	\$114
Sportster 14400 Internal Modem with Fax (SPT14400FX)	\$117
Sportster 14400 External Modem (SPT14400E)	\$132
Sportster 14400 External Modem with Fax (SPT14400FX)	\$135
Worldport 14400 WPA44FX	\$199
US ROBOTICS-COURIER	
V34 Ready Data/Fax with VFC Internal (C0FC0FX)	\$389
V34 Ready Data/Fax with VFC External (C0FC0FXE)	\$425
V32 Turbo Internal (C07000)	\$330
V32 Turbo Internal with Fax (C07000FX)	\$343
V32 Turbo External (C07000E)	\$376
V32 Turbo External with Fax (C07000FXE)	\$395
Dual Std V34 Ready Turbo Internal with Fax (C07000FX)	\$519
Dual Std V34 Ready Turbo External with Fax (C07000FXE)	\$555
Supra 14400 Internal (14400I)	\$117
Supra 14400 External 144 ELC (14400E)	\$129
Supra 14400 External w/ALPHA number display (14400E)	\$199
Supra 28800 External Fax (28800FX)	\$259
Supra 28800 Internal Fax (28800FX)	\$227
Supra Express 14400 Internal (14400EXPRESS)	\$79
Supra Comcard 14400 PCMCIA Type II (14400PC)	\$244

LEXMARK
4039-10R
600x600dpi
Laser Printer
\$1235

Call For All Other Models

7AM to 5PM Mon. - Fri., 10AM to 4PM Sat. CST

TC COMPUTERS

1-800-723-7287
Corporate Line 1-800-723-9497 In Louisiana Call (504) 733-2527
5005 Bloomfield, Jefferson, LA 70121

CD ROM Drives

Chinon	Dual Speed SCSI 300KB/sec, 280ms w/256K Cache (CDS300S)	\$295
Toshiba	3401B Internal Dual Speed, 200ms 256K buffer, XM401TA	\$289
Toshiba	4101B Dual Speed (M4101B)	\$205
Plextor	240ms Access, 64KB Buffer 335KB/sec Transfer Internal Bare Drive-No Controller (PEX240S)	\$265
	Internal Drive with SCSI Controller (PEX240S-ASOM)	\$315
Plextor	NEW! Quad Speed 4X, 2 Year Warranty! PEX400H	\$469
Sony	CDU33A Dual Speed With Controller (SOM33A)	\$139
	CDU33A Packed w/Sound Blaster 16 by Creative Labs (PAC33A)	\$245

Controller Cards

Caching Controllers (ISA)	
Promise-IDE Hard/Floppy w/OK expandable to 16MB (IC200)	\$85
Caching Controllers (VESA Local Bus)	
Promise-IDE VESA Local Bus Hard/Floppy w/OK exp. to 16MB (IC400)	\$109
Promise-IDE VESA Local Bus Hard/Floppy w/512K w/IO (IC400)	\$95
Bus Logic IDE VESA Local Bus w/OK expandable to 16MB (VKT410)	\$129
Bus Logic IDE PCI Local Bus w/OK expandable to 16MB (VKT910)	\$179
Non-Caching Controllers	
16-Bit DFI Hard/Floppy Cont. w/1Par, 2Ser, 1 Game Pt. IDE (DFI060)	\$29
Adaptec 1510A SCSI 2 CD Kit (A1510A)	\$559
Adaptec 1542CF SCSI 2 (A1542CF)	\$205
Adaptec 2742T EISA SCSI 2 (A2742T)	\$335
Adaptec 2842 VLB SCSI 2 (A2842VLK)	\$299
Adaptec Slim SCSI PCMCIA (SPA460)	\$225
DTG SCSI Hard/Floppy Controller no I/O ports (3280)	\$115
VESA Local Bus IDE Hard/Floppy Controller w/1Par 2 Ser 1 Game (VL05)	\$25
VESA Local Bus IDE Hard/Floppy w/IO & FAST UART (VL05S50)	\$39
Bus Logic SCSI ISA Bus Master (BT542)	\$165
Bus Logic SCSI EISA Bus Master (BT742A)	\$219
Bus Logic SCSI VESA Local Bus Master (BT445)	\$210
DTG VESA Local Bus SCSI Controller Card 32-Bit Hard/Floppy 3200	\$125
16-Bit DFI Hard/Floppy Cont. w/FAST JART & 1Par 2 Ser 1 Game (DFI550)	\$49

Robotics
LOWEST PRICES ANYWHERE!!!

PLEXTOR
Quad Speed 4X CD-Rom,
180ms access, 600KB/sec transfer, 1MB Buffer, 70,000 Hours MTBF, 2 Year Warranty
\$469

Sound Cards

Diamond Sonic 16 LX Sound Card (SONCLX)	\$89
Diamond Sonic 16 Bit Sound Card (SONCL)	189
Media Vision Pro Audio Studio 16 (STUDIO)	115
Media Vision Pro Audio Spectrum 16-Bit Sound Card (SPECTRUM)	95
Creative Labs Sound Blaster 16 SCSI2 (SB16S)	129
Creative Labs Sound Blaster 16 ASP (SB16ASP)	195
Creative Labs Sound Blaster AWE 32 (AWE32)	264

MONITORS

Viewsonic V6E 14" 1024x768 Non-Interlaced 28" (VIEW6E)	\$289
Viewsonic V15E 15" 1280x1024 NEW ENERGY STAR! (VIEW15E)	\$369
Viewsonic V15EX 15" 1280x1024 NEW ENERGY STAR! (VIEW15EX)	\$395
Viewsonic 15" 1280x1024 76Hz Refresh @ 1024x768 (VIEW15)	\$425
Viewsonic 17E 17" 1280x1024 NEW ENERGY STAR! (VIEW17E)	\$425
Viewsonic 17G 17" Green 1600x1280 SVGA (VIEW17G)	\$799
Viewsonic 17" 1280x1024 Non-Interlaced 7m	\$899
Viewsonic 20" 1600x1280 User Programmable Modes (VIEW20)	\$1499
Viewsonic 21" 1600x1280 User Programmable Modes (VIEW21)	\$1689
MAG 15" 1280x1024 SVGA NEW ENERGY STAR! (MAG15E)	\$345
MAG 15" 1280x1024 Digital (MAG15D)	\$459
MAG 17" 1280x1024 SVGA NEW ENERGY STAR! (MAG17E)	\$679
MAG 17" 1280x1024 NI Digital (MAG17D)	\$795
MAG 17" 1280x1024 SVGA NEW ENERGY STAR! (MAG17FG)	\$819
CTX 14" 28 SVGA 1024x768 NI 50-90Hz Vertical (CTX14)	\$249
CTX 15" 28 SVGA 1024x1024 ENERGY STAR Analog (CTX15)	\$335
CTX 17" 28 SVGA 1280x1024 NI ENERGY STAR Digital (CTX17)	\$679
14" 39 SVGA 1024x768 Interlaced 50-70Hz Vertical (EM1439)	\$189
14" 28 SVGA 1024x768 Interlaced 50-70Hz Vertical (EM1428)	\$210
14" 28 SVGA 1024x768 Non-Interlaced (EM1428N)	\$230

MAG
15" DX15F
Energy Star
1280x1024
\$345



**Winner of 22
"Best Buy"
Awards
Including
1993
Hardware
Peripherals
Vendor of the Year!**

PC Computing's



"4 1/2-Star" Rating as Top Direct Vendor

PC Computing's "Direct 60" - July, 1994

IBM ThinkPad®

ThinkPad® 500

IBM ThinkPad 350C Color	
125MB HD, 4MB RAM 261RND4	*1599
250MB HD, 4MB RAM 261RPOA	*1999
NEW IBM ThinkPad 360 Mono	
170MB HD, 4MB RAM 261200D	*1999
NEW IBM ThinkPad 360 Dual Color	
170MB HD, 4MB RAM 261202D	*2599
NEW IBM ThinkPad 360C Active Color	
170MB HD, 4MB RAM 261203D	*3499
340MB HD, 4MB RAM 261203F	*3999
IBM ThinkPad 500 Mono	
85MB HD 26016RN	*799
170MB HD w/FREE Software 260317N	*999
IBM ThinkPad 510 Dual Scan Color	
170MB HD 260317N	*1699



Compaq LTE Lite/25E

The Compaq LTE Lite/25E

Features Intel 386SL-25MHz processor, 64K Cache, 4MB RAM (Max. 20MB), 8.5"x 11"x 2", 6.3 lbs., 9.5" high contrast active matrix mono LCD, MS-DOS, Windows & Integrated TrackBall.

Include FREE Quick Connect Port Replicator

Model	Hard Drive	Part #	Price
LTE Lite	9.84MB	138000-003	\$949
LTE Lite	125MB	138000-004	\$999

Portable PC Power at Affordable Prices!

ActionNote 4000 Mono	
80MB A433211	*1299
120MB A433221	*1349
170MB A433241	*1399
ActionNote 4SLC2-50 Mono	
180MB A471221	*1429
W/24/96 Data/Fax Modem	
180MB A472221	*1529
ActionNote 500C Pass. Matrix Color	
180MB A475241	*2039
ActionNote 700 Series	
700 120MB, 9.5" Mono A478201	*1859
700 210MB, 9.5" Mono A478221	*1929
700C 210MB, 9.5" Color A479221	*2549
700CX 210MB, 8.5" Active Matrix A480221	*3199
NEC	
VERSA 50EC 486DX2-50MHz,	
209MB PC-450-1521	*3729
340MB PC-450-1541	*3999
VERSA 75EC 486DX4-75MHz,	
340MB PC-460-1541	*4229
VERSA S/33 486SL-33MHz,	
210MB	Starting at *1899
VERSA S/50C 486SL-50MHz,	
260MB PC-130-11211	*3649
CANON	
NoteJet 486C 486SX-33MHz, with built-in Hi-res. BubbleJet™ printer	
120MB NJ486C-120	*2799
NoteJet II 486C 486SLC2-50MHz, with built-in Hi-res. BubbleJet™ printer	
200MB NJ486CII/260	*2999

SHARP	
Color LCD Notebook Computers	
200MB HD, 9.4" DualScan Color LCD.	
SH-PC8150T	*2199
8.4" Active-matrix Color TFT LCD.	
SH-PC8650T	*2999
TOSHIBA	
T1910 Mono, 200MB PA11114U-M2A	
T1950CS 9.5" Color -Passive	*1450
200 MB PA1152U-S2A	*2279
T1950CT 8.4" Color -Active,	
200 MB PA1152U-T2A	*2879
T1960CT Color Active	
200MB PA1170U-T2A	*2999
T3400 8.4" Mono.	
PA1116U-M9A	*1689
T3400CT 7.8" Color Active Matrix	
PA1116U-T9A	*2749
T3600CT 8.4" Color Active Matrix	
PA1119U-T9A	*3999
T4700CS Color Dual-scan Passive	
200MB PA1156U-S2A	*3099
T4700CT Color Active Matrix	
200MB PA1158U-T2A	*4439
T4800CT Color Active Matrix	
500MB PA1161U-T2A	*5489
T8600C CD-ROM ready	
PA1609U-X7A	*6129
T8600C/CD Includes Int. CD-ROM	
PA1609U-X8A	*6599

Texas Instruments	
TravelMate™ 4000E 486 Series	
8.5" Passive Color,	
120MB HD 2646692-0001	*1729
TravelMate 4000E WinDX2/40	
8.2" Advanced Passive Color,	
200MB HD 2581375-0001	*2089
TravelMate 4000E WinDX2/50	
9.4" Dual Scan Color, 200MB HD 2646694-0001	*2359
TravelMate 4000E WinDX2/50	
8.4" Active Matrix Color,	
200MB HD 2581011-0001	*2859
TravelMate 4000E WinDX4™/75	
9.4" Active Matrix Color,	
455MB HD 9792950-0001	*4459
TravelMate™ 4000M 486 Series	
TM4000 M Mono 486 SL Enhanced SX/25 MHz, 9.5" Display, 120MB HD,	
6.1 lbs. 9792534-0001	*1849
TM4000 M Advanced PassiveColor	
486 SL Enhanced SX/25 MHz, 8.2" Display,	
120MB HD, 6.4 lbs. 9792532-0001	*2099
TM4000 M Active Matrix Color 486 SL	
Enhanced SX/25 MHz, 8.4" Display,	
200MB HD, 6.4 lbs. 9792533-0001	*2939
TM4000 M Active Matrix Color	
486 DX2/50 MHz, 8.4" Display, 340MB HD	
6.4 lbs. 9798153-0001	*3359
TM4000 M Active Matrix Color	
486 DX4/75 MHz, 8.4" Display, 344MB HD	
6.4 lbs. 9794061-0001	*4859

Modems

BOCA	
14.4K W/FAX Int/Ext	*89/115
14.4K Pocket W/FAX	*169
24/96 Pocket Data/Fax	*69
24 data, 96 S/R w/voice Int/Ext	*75/95
24 data, 96/48 S/R Int/Ext	*39/59
HAYES	
PCMCIA Optima 144+ fax	*289
Accura 24 Int/Ext	*59/69
Accura 144+ fax/144 Int/Ext	*115/139
Optima 28.8/14.4	*259
Optima 28.8/14.4 Int/Ext	*368/379
Optima 144+ fax Pocket Ed.	*299
PRACTICAL PERIPHERALS	
PCMCIA practiCARD	*289
14/14/4 V.32bis Pocket	*309
14/14/4 V.32bis Int/Ext	*109/129
28.8/14.4 V.32bis Int/Ext	*229/249
14/14/4 V.32bis PS/2 MicroChannel	*379
US ROBOTICS	
144/144 Faxmodem Int/Ext	*119/139
SetisFAXtion 400 / 400e	*279/309
144/144 Faxmodem PCMCIA	*239
MEGAHERTZ	
PCMCIA X-Jack 24-96/14.4	*95/219
PCMCIA Gold Series X-Jack	*239
PCMCIA Gold Series 14.4	*239

COMPUTER SOURCE!

NEW

3 Year Warranty
with FLEX Express parts replacement

Includes Windows

Includes Pentium 64bit Processor

The Ultimate Multimedia Choice!

FLEX PT60

Pentium™ Multimedia System

All For Only \$2995

Includes Sony/Sound Blaster CD-ROM Bundle

Includes Hewlett-Packard Color Printer

Includes 8 CD-ROM Titles

*** FLEX PT60 60MHz System**

- Genuine Intel Pentium 60MHz 64bit Processor
- 256K ultra-fast Writeback Cache Memory
- 8MB RAM Maximum 128MB on System Board
- 3.5" 1.44MB Floppy Drive
- 420MB IDE Hard Drive w/ 28K Cache
- 15" 28 Pin SVGA MultiScan Monitor

*** Hewlett-Packard DeskJet 500C Printer**

*** 24/96 Data/Fax Multimedia Modem**

*** SONY/Sound Blaster CD-ROM Bundle**

- Sony Double Spin internal CD-ROM Drive
- Creative Labs Sound Blaster 16 Audio Board
- 8 CD-ROM Discs

*** Microsoft Software and Accessories**

- Microsoft DOS 6.2, Windows for Workgroups 3.11, Works for Windows
- FREE Accessories Kit

NEW

Flex Custom Systems

The FLEX Custom Systems offer you top-level performance and reliability in an easily-upgradeable design. And now, USA Flex gives you more features and choices than ever before, all backed by our exclusive 3 Year FlexExpress Warranty. With Flex Custom Systems, you don't have to compromise on specifications, power or price!

Flex Custom Systems Now Feature

15" SVGA Multiscan Monitors



486 Systems feature

- 486SX, 486SX2 or 486DX2 32bit Processor
- 7 ISA 16 bit slots with 3 VLB 32-bit slots
- 4-64MB RAM (Max) • 256K Cache
- 3.5" 1.44MB FD (Dual Drive Optional)
- VLB Video Accel. Card with 1MB RAM
- 24/96 Data/Fax/Voice Multimedia Modem
- Desktop, MidTower (7 Bay) or Full-Tower
- 15" SVGA Multiscan Color Monitor (28mm 1024x768 Non-Interlaced)
- Enhanced 101 Keyboard • MS Mouse
- MS DOS 6.22 w/Data Compression
- Windows for WorkGroups 3.11 • MS Works

Pentium Systems feature

- 60 or 90MHz 64bit Pentium Processor
- 3 PCI/5 ISA Slots
- 8 MB RAM (Max) 128MB • 256K Cache
- 3.5" 1.44MB FD (Dual Drive Optional)
- Video Accelerator Card w/1MB RAM
- 24/96 Data/Fax/Voice Multimedia Modem
- Desktop, MidTower (7 Bay) or Full-Tower
- 15" SVGA Multiscan Color Monitor (28mm 1024x768 Non-Interlaced)
- Enhanced 101 Keyboard • MS Mouse
- MS DOS 6.22 w/Data Compression
- Windows for WorkGroups 3.11 • MS Works

Systems above shown with optional cases. Dual Floppy drives, CD-ROM, and tape backup units.

VL486SX-33	Desktop Case, 4MB, 340MB HD	\$1349
VL486DX2-66	Desktop Case, 4MB, 420MB HD	\$1649
VL486DX2-66	10 Bay Tower, 8MB, 540MB HD	\$1999
PT-60	Pentium CPU, Desktop Case, 8MB, 420MB HD	\$1999
PT-90	Pentium CPU, Tower Case, 8MB, 420MB HD	\$2499

Flex 486 CD Special

UPGRADABLE 486 SYSTEM:



486SX System
CD-ROM • Monitor
Keyboard • Mouse
Software & Games

3 Year FLEX Express Warranty
on system unit.
Standard manufacturer's warranty on all other items. Unlimited Toll-free Technical Support.



Internal CD-ROM Drive
(Sony Access Time: 160K/sec Transfer)

PLUS A Full Compliment of Software including:
MS DOS 6.22, Windows 3.11, PFS Window Works, F-117A Stealth Fighter, Red Storm Rising, Software Toolworks Interactive Encyclopedia

IBM® ValuePoints®

64 bit Accelerated S3 Vesa Local Bus video. Supports up to 4 IDE Drives. IBM SurePrint™ Flash BIOS. 4 or 8MB RAM (Max 64MB). VLB SVGA video (up to 1280x1024 Res. One 3.5" 1.44MB FD). 101-key keyboard. IBM DOS 6.1. Windows 3.1. 3 year warranty, 24-hour IBM HelpWare.

Model	Processor Speed	Hard Drive	RAM Size	Slots 16/32	3.5"/5.25" Bays	Video RAM	Flex Part #	Flex Price*
IBM ValuePoint S3 Space Saver Case, 32 bit Video, non-upgradeable bus								
486SX	25 MHz	21 MB	4MB	3/0	2/1	512K	64S2150	\$945
486DX	33 MHz	21 MB	4MB	3/0	2/1	512K	64S2150	\$1290
IBM ValuePoint 10 Bay Tower Case, Space Saver, 3.5/5.25 bays are available								
486SX	33 MHz	21 MB	4MB	3/0	2/1	1 MB	64S2141	\$1560
486DX2	66 MHz	364MB	8MB	2/1	2/1	1 MB	64S2141	\$2395
IBM ValuePoint 10 Bay Tower Case, Space Saver, 3.5/5.25 bays are available								
486SX	33 MHz	21 MB	4MB	3/0	2/1	1 MB	64S2141	\$1620
486DX2	66 MHz	364MB	8MB	3/4	2/1	1 MB	64S2141	\$2455
IBM ValuePoint 10 Bay Tower Case, Space Saver, 3.5/5.25 bays are available								
486DX2	66 MHz	364MB	8MB	3/5	4/2	1 MB	64S2141	\$2575
IBM ValuePoint (Pro)								
Pentium P60/D		Hard Drive/Ave. Access	Standard RAM	Slots/Bays			Flex Part #	Flex Price*
		527MB/8.7ms	8 MB	4x5			6384193	\$2860

IBM and HelpWare are registered trademarks and IBM ValuePoint is a trademark of International Business Machines Corporation. Pentium is a trademark of Intel and the IBM logo is a registered trademark of International Business Machines Corporation. Microsoft, Windows and the Microsoft logo are registered trademarks of the Microsoft Corporation.

Mail Order Made Easy! By...

USA FLEX

USA Flex, Inc., 471 Brighton Dr., Bloomingdale, IL 60018

TO ORDER CALL

1-800-333-4515

Federal Express® Delivery Service Available

No Surcharge On These Credit Cards



USA

FLEX

YOUR

Create Your Own Multimedia!

1 Choose Your CD-ROM Drive

FLEX CD-PRO STARTER KIT

\$149
CDPRO1

Double Spin Internal CD-ROM drive with interface card and instructions
• 320ms access time • 0KB/sec transfer rate • multi-session Kodak PhotoCD Compatible

FLEX CD-PRO CLASSIC CREATIVE SONY

\$249
CDPRO1

Sony 2X Spin Int. drive
• 320ms access time • 300KB/sec transfer
Sound Blaster 16 Sound Card
• 16-bit stereo sampling & playback • 20-voice
• ASP & WaveBlaster upgradable. Speakers required

2 Choose Your CD-ROM Titles

1 Free CD is included with either Kit sold above PLUS Buy any 3 more CD-ROMs for only \$49! (Ask your sales rep for selection of CD-ROM titles.)

3 Choose Your Speakers

Select from models by Sony, Jensen, Labtech, Altec Lansing, Panasonic & more!

Ask your Flex Consultant for Details about this Multimedia Offer

CD-ROM Drives/Multimedia Kits

NEC

MultiSpin 3Xe External	\$459
MultiSpin 3Xi Internal	\$424
MultiSpin 3Xp Personal	\$379
MultiSpin 4X Pro	\$929

MITSUMI

Double-Speed CD-ROM Drive	\$139
---------------------------	-------

CHINON

2X Int. CD-ROM Drive	\$325
2X Int. CD-ROM Drive w/SCSI VF	\$349

TOSHIBA

2X Int. CD-ROM Drive	\$319
2X Ext. CD-ROM Drive	\$569

SONY

Internal Drive Kit	\$169
--------------------	-------

MEDIAVISION

RENO Portable CD-ROM	
Disk Player	\$299
Family Deluxe Multimedia Kit	\$299
Premium Deluxe Multimedia Kit	\$499

CREATIVE LABS

Creative OmniCD	\$179
Omni CD 3X	\$429
SB Discovery™ CD 16	\$309
SB Edutainment™ CD 16	\$409
Game Blaster CD 16	\$379
Sound Blaster DigitalEdge 3x	\$689
Sound Blaster Value Edition	\$59
Sound Blaster Pro Value	\$79
Sound Blaster 16 SCSI-2	\$169
Sound Blaster 16 MultiCD	\$139
Sound Blaster AWE32	\$269
Wave Blaster	\$175
Voice Assist	\$55

TURTLE BEACH

WAVE™ 2.0	\$73
Maul Wavetable Synthesizer	\$155
MultiSound Monteray™ MM	\$349
Rio Waveblaster™ compatible Synthesizer	\$149

ORCHID

SOUND WAVE 32	\$179
GAMEWAVE 32	\$119

Monitors and Video!

NEW!



CTX

Your Ideal Display Solutions!



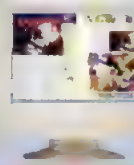
MPR II

Special Pricing on NEC

Factory Serviced Color Monitors

Include 1 Year Warranty

3FG 15" .28mm	\$439
4FG .28mm	\$529
5FG 17" .28mm	\$849
6FG 21" .28mm	\$1649



Limited Quantity

NEW!

Hercules Stingray

Fast & Powerful Graphics Accelerator for Windows, OS 2 and Windows NT



Hercules quality, performance and support at a great price!

\$99
SUNSHINE

NEC

14" SVGA	\$283
14" 2V	\$329
15" 3V	\$469
15" 3FG	\$557
15" 4FG	\$617
17" 5FG	\$998
17" 5FGp	\$1094
21" 6FG	\$1998

CTX

14" .39mm	\$199
14" .28mm	\$239
14" .28mm E Star & MPR-II	\$245/\$269
14" .28mm E Star & MPR-II	\$289/\$295
15" .28mm	\$319
15" .28mm E Star & MPR-II	\$339
17" .28 NI	\$649

DAEWOO

14" LX1450LG	\$269
15" DX15F	\$369
15" MX15F-L	\$479
17" DX17F	\$669
17" MX17F-L	\$899
21" MX21FG	\$1799

SONY

15" CPD-15SF	\$459
17" CPD-1730E	\$969
17" GDM-17SE1	\$999
20" GDM2036S	\$1899
Universal MAC cable adaptor	\$17.95

MAGNAVOX

14" Paper White Mono VGA	\$109
14" M2089	\$239
14" M2099	\$259
15" CM4015	\$359
17" CM4017	\$649
20" 20CM64	\$1039

NOKIA

14" D1-44BS	\$399
15" D1-449E	\$499
17" D1-447B	\$899
21" D1-445M	\$1929

ATI Technology

GRAPHICS ULTRA+ 2MB	\$209
GRAPHICS ULTRA™	
PRO 2MB ISA	\$279
GRAPHICS ULTRA™	
PRO 2MB VLB	\$279
GRAPHICS ULTRA™	
PRO 2MB EISA	\$309

SHARP

SPEEDSTAR PRO 1MB	\$109
SPEEDSTAR 64-1MB	\$145
SPEEDSTAR 64-2MB	\$189
STEALTH 32-1MB	\$165
STEALTH 32-2MB	\$209
STEALTH 64-2MB	\$329
STEALTH 64-4MB	\$469
VIPER 2MB VLB	\$339
VIPER 2MB PCI	\$349

ORCHID

KELVIN 64 1MB ISA/VLB/PCI	\$175
KELVIN 64 2MB ISA/VLB/PCI	\$225

HERCULES

Stingray VLB 1MB	\$99
Stingray PCI 1MB	\$99
Dynamite Pro ISA 2MB	\$199
Dynamite Pro VLB 2MB	\$199
Dynamite Power 2MB VLB	\$209
Dynamite Power 2MB PCI	\$209
Graphite Power ISA 1MB	\$229
Graphite Power ISA 2MB	\$349
Graphite Power VLB 1MB	\$199
Graphite Power VLB 2MB	\$289

Video Capture Boards

ORCHID

Videoa	\$369
--------	-------

ADS

Video Clipper	\$315
PC Prime Time	\$325
VGA-TV Elite Int./Ext.	\$149/\$229

AI Tech

MultiPro CTV	\$279
ProPC/TV Plus	\$149
Wavewatcher TV	\$329

Call today for our complete catalog of over 10,000 Name Brand items at affordable prices!

Mail Order Made Easy! By...

USA FLEX

USA Flex, Inc., 471 Brighton Dr., Bloomingdale, IL 60108

Code # PM09B4

TO ORDER, CALL...

1-800-766-1940

Federal Express Delivery Service Available

No Surcharge On These Credit Cards





“So tell me, what makes VTech different from all the other computers in this magazine?”





Rick Matusky
President
VTech Computers

"For starters, how about more than 10 years in the business."

For more than a decade we've been building our presence in the computer industry, creating a personal computer that now ranks amongst the top in the world. We give all the credit for this success to the thousands of staff members that make up our integrated worldwide network.

We're also preparing to lead the technology revolution into the next century through a commitment to research and development that guarantees our customers always receive the latest products.

"If that's not enough, you can pick only the options you need."

We believe a computer company has to understand the needs of the people who use them. So we've introduced a new buying system called the **"As You Like It" Complete Customization Program**, and it works like this:

- Call our product consultant. He'll help you choose the best base system.
- Pick only the options you want to create your personalized computer.
- Our engineers will custom build your system using the components you requested.
- Your personalized system is then delivered directly to you.

And of course, your new system is pretested and approved, and all parts and labor are covered by the VTech warranty.

"You never have to worry, if you need us we'll be there."

As our customer you have the right to expect the best service, quality and performance from our people and products. As a VTech customer you can rely on:

- Guaranteed replacement parts—FAST!
- A continuously trained technical support staff that is updated on all the latest technology to give you the kind of service that gets you running, and keeps you running.
- Someone will always be at your disposal at convenient hours.
- One phone call to one person on our technical support staff will handle all of your problems.

"Talk about quality control, we're our own manufacturer."

The reliability of our product quality is the direct result of our own manufacturing excellence. We make our own motherboards, easy-touch keyboards, and power supplies so that we can ensure only the highest quality product, and pass on the cost savings to you. It also allows us to use environmentally safe processes.

Also, throughout the manufacturing process we test every operation to make sure each piece stands up to our strict performance standards.

Finally, we work with only the most respected leaders in the industry like Intel, Orchid, Colorado, and Conner. Testing everything for its compatibility.

"But you don't have to take my word for it."

"The overall performance of the VTech computer gives it the highest rating of the 486 systems, and jaw-dropping price is outstanding."

Computer Shopper, February, 1994

"Serious systems and bare-knuckles pricing make VTech the best..."

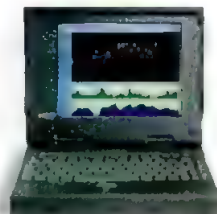
PC Computing, July 1994

VTECH®
expotech™

1-800-816-0070



VTech's Personal Tower



The new LT400 Series Notebook
The LT432C/453C have a right-side mounted trackball.



Multimedia systems



High-performance Pentium™ systems



VTech's new High-Tech Tower



VTech's new 5-Bay Desktop

PC Computing
★★★★

“With a product line this great, the only thing better would be amazingly low prices. Just like these.”

EXPO 486SX/33V
• Pentium™ Technology Ready • 4MB RAM with 128K Cache • 213MB (12ms) Conner IDE Hard Drive • VLB Graphics with 1MB • 3.5" Diskette Drive • 14" VTech SVGA HiRez Monitor • Dual Cooling Fans • Pre-Loaded MS-DOS 6.2 & Windows 3.1 • Enhanced 101-Key Keyboard & Mouse
\$999

EXPO 486SX/33VM
• Pentium™ Technology Ready • 4MB RAM with 128K Cache • 424MB (14ms) Conner IDE Hard Drive • Double Speed CD-ROM • 16-Bit Stereo Sound Board • VLB Graphics with 1MB • 3.5" Diskette Drive • 15" VTech SVGA HiRez Monitor • Dual Cooling Fans • Pre-Loaded MS-DOS 6.2 & Windows 3.1 • Enhanced 101-Key Keyboard & Mouse
\$1349

EXPO 486DX/33V
• Intel Verified: for the Pentium™ OverDrive™ Processor • 4MB RAM with 128K Cache • 424MB (14ms) Conner IDE Hard Drive • VLB Graphics with 1MB • 3.5" Diskette Drive • 14" VTech SVGA HiRez Monitor • Dual Cooling Fans • Pre-Loaded MS-DOS 6.2 & Windows 3.1 • Enhanced 101-Key Keyboard & Mouse
\$1299

EXPO 486DX2/50VM
• Intel Verified: for the Pentium™ OverDrive™ Processor • 4MB RAM with 128K Cache • 424MB (14ms) Conner IDE Hard Drive • Double Speed CD-ROM • 16-Bit Stereo Sound Board • Stereo Speakers • VLB Graphics with 1MB • 3.5" Diskette Drive • 15" VTech SVGA HiRez Monitor • Dual Cooling Fans • Pre-Loaded MS-DOS 6.2 & Windows 3.1 • Enhanced 101-Key Keyboard & Mouse
\$1599

EXPO 486DX2/66V
• Intel Verified: for the Pentium™ OverDrive™ Processor • 4MB RAM with 128K Cache • 424MB (14ms) Conner IDE Hard Drive • VLB Graphics with 1MB • 3.5" Diskette Drive • 14" VTech SVGA HiRez Monitor • Dual Cooling Fans • Pre-Loaded MS-DOS 6.2 & Windows 3.1 • Enhanced 101-Key Keyboard & Mouse
\$1399

EXPO 486DX2/66VM
• Intel Verified: for the Pentium™ OverDrive™ Processor • 8MB RAM with 128K Cache • 527MB (12ms) Conner IDE Hard Drive • Double Speed CD-ROM • 16-Bit Stereo Sound Board • Stereo Speakers • VLB Graphics with 1MB • 3.5" Diskette Drive • 15" VTech SVGA HiRez Monitor • Dual Cooling Fans • Pre-Loaded MS-DOS 6.2 & Windows 3.1 • Enhanced 101-Key Keyboard & Mouse
\$1799

Platinum 486DX2/66 PCI
• Intel Verified: for the Pentium™ OverDrive™ Processor • 8MB RAM with 256K Cache • 424MB (14ms) Conner IDE Hard Drive • PCI Local Bus Graphics with 1MB • Built-In SCSI Adapter • 3.5" Diskette Drive • 14" VTech SVGA HiRez Monitor • Dual Cooling Fans • Pre-Loaded MS-DOS 6.2 & Windows 3.1 • Enhanced 101-Key Keyboard & Mouse
\$1649

Platinum 486DX2/66 PCI
• Intel Verified: for the Pentium™ OverDrive™ Processor • 8MB RAM with 256K Cache • 527MB (14ms) Conner IDE Hard Drive • Double Speed CD-ROM • PCI Local Bus Graphics with 1MB • Built-In SCSI Adapter • 3.5" Diskette Drive • 15" VTech SVGA HiRez Monitor • Dual Cooling Fans • Pre-Loaded MS-DOS 6.2 & Windows 3.1 • Enhanced 101-Key Keyboard & Mouse
\$1899

Platinum P5-60
• Intel 60 MHz Pentium™ CPU • 8MB RAM with 256K Cache • 424MB (14ms) Conner IDE Hard Drive • PCI Local Bus Graphics with 1MB • Built-In SCSI Adapter • 3.5" Diskette Drive • Enhanced Parallel Port • High Speed Serial Port Controllers • 14" VTech SVGA HiRez Monitor • Pre-Loaded MS-DOS 6.2 & Windows 3.1 • Enhanced 101-Key Keyboard & Mouse
\$1849

Platinum P5-60
• Intel 60 MHz Pentium™ CPU • 8MB RAM with 256K Cache • 527MB (14ms) Conner IDE Hard Drive • PCI Local Bus Graphics with 1MB • Built-In SCSI Adapter • 3.5" Diskette Drive • Enhanced Parallel Port • High Speed Serial Port Controllers • 15" VTech SVGA HiRez Monitor • Double Speed CD-ROM • Pre-Loaded MS-DOS 6.2 & Windows 3.1 • Enhanced 101-Key Keyboard & Mouse
\$2099

Platinum P5-66
• Intel 66 MHz Pentium™ CPU • 8MB RAM with 256K Cache • 424MB (14ms) Conner IDE Hard Drive • PCI Local Bus Graphics with 1MB • Built-In SCSI Adapter • 3.5" Diskette Drive • Enhanced Parallel Port • High Speed Serial Port Controllers • 15" VTech SVGA HiRez Monitor • Pre-Loaded MS-DOS 6.2 & Windows 3.1 • Enhanced 101-Key Keyboard & Mouse
\$1999

Platinum P5-66
• Intel 66 MHz Pentium™ CPU • 16MB RAM with 256K Cache • 527MB (12ms) Conner IDE Hard Drive • PCI Local Bus Graphics with 1MB • Built-In SCSI Adapter • 3.5" Diskette Drive • Enhanced Parallel Port • High Speed Serial Port Controllers • 15" VTech SVGA HiRez Monitor • Double Speed CD-ROM • Pre-Loaded MS-DOS 6.2 & Windows 3.1 • Enhanced 101-Key Keyboard & Mouse
\$2499

LT432C 486SX/33

- 4MB RAM expandable to 20MB
- 200 MB Hard Drive
- 5.5 lbs.
- NiMH Battery
- 9.7" Sharp™ Dual Scan Color Screen
- Accelerated Video
- Right-side Mounted Trackball
- Small (11" x 8.4" x 1.8") Footprint
- 2 PCMCIA Type II and 1 Type III
- Pre-Loaded MS-DOS 6.2 & Windows 3.1

\$1799**LT453C 486DX2/50**

- 4MB RAM expandable to 20MB
- 200 MB Hard Drive
- 5.5 lbs.
- NiMH Battery
- 9.7" Sharp™ Dual Scan Color Screen
- Accelerated Video
- Right-side Mounted Trackball
- Small (11" x 8.4" x 1.8") Footprint
- 2 PCMCIA Type II and 1 Type III
- Pre-Loaded MS-DOS 6.2 & Windows 3.1

\$1999**LT450C 486DX2/50**

- 4MB RAM expandable to 20MB
- 340 MB Hard Drive
- 6 lbs.
- NiMH Battery
- 9.7" Sharp™ Dual Scan Color Screen
- Accelerated Video
- Center-mounted 19mm Trackball with Palm rest
- Small (11" x 8.5" x 2") Footprint
- 2 PCMCIA Type II and 1 Type III
- Pre-Loaded MS-DOS 6.2 & Windows 3.1

\$2199**LT470C 486DX4/75**

- 8MB RAM expandable to 20MB
- 455 MB Hard Drive
- 6 lbs.
- NiMH Battery
- 9.7" Sharp™ Dual Scan Color Screen
- Accelerated Video
- Center-mounted 19mm Trackball with Palm rest
- Small (11" x 8.5" x 2") Footprint
- 2 PCMCIA Type II and 1 Type III
- Pre-Loaded MS-DOS 6.2 & Windows 3.1

\$2699**VTech Upgrades**

Choose from these options to create the computer you've always wanted.

Tape Back-Ups	RAM	Modem	Floppy Drives	Hard Drives	Multimedia	Monitor	Video Card
• 250MB Colorado	• 4MB RAM • 8MB RAM • 16MB RAM • 32MB RAM	• 9600/2400 Data Fax Modem • 14,400 bps Fax/Modem • Remote Diagnostic Program • Prodigy 30-day free trial	• 5.25" Diskette Drive • Combo 3.5" and 5.25" Diskette Drives	• 210MB 14ms IDE • 270MB 13ms IDE • 424MB 13ms IDE • 527MB 12ms IDE	• 16-Bit Stereo Sound Board • Double Speed CD-ROM • Koss Speakers • Multimedia Software Bundles	• 14" NI HiRez • 15" NI HiRez • 17" NI HiRez • 21" NI HiRez	• Diamond • Orchid Kelvin 64

The VTech/GE Service Plus Program

With VTech's on-site service, in conjunction with the optional extended GE Service Plan, you'll get 4 years of superior technical service and support. It's the ultimate in security from the top name in service, at a very low price. You won't find it offered by any other direct seller.



**Service
Protection
Plus**

VTech Software Bundles

Top multimedia software bundles each with 4 CD-ROM's that are tested and certified by VTech to work with your configuration. Each bundle costs you only \$59, saving you hundreds of dollars from the manufacturer's list price.

THE GREAT OUTDOORS

San Diego Zoo: Animals - See and hear your favorite animals from around the world. Includes 60 minutes of video clips.

Ocean's Below - Over 200 video segments are included in the underwater exploration of exotic destinations. 125 photos of underwater plant life, animals, and plane wrecks.

Everywhere USA - This CD is great for vacation planning with over 3,000 attractions and things to do. Covers all of the United States.

Adventures - An exploration of unusual travel expeditions and adventurous vacations. Comes with over 1,000 tours and 2,500 full color photos.

HOME, HEALTH & FAMILY

Compton's Interactive Encyclopedia - A 26 volume encyclopedia with pictures, drawings, and photos. Includes on-line Merriam-Webster Dictionary.

Mayo Clinic Family Health Book - Provides reliable, practical, and easy to understand information concerning issues on good health. Most of the information comes from physicians and research scientists at the Mayo Clinic.

Family Choices - 15 best-selling titles for the whole family. Everything from business to great books to puzzles for the kids.

Healing Foods Cookbook - 400 recipes on eating healthy including nutrition studies.

JUST FOR FUN

7th Guest - A virtual multimedia mystery! You wander through a 3D haunted house solving puzzles.

MegaRace - A futuristic virtual driving experience. 3D graphics and high speed chases with deadly weapons.

Star Wars Chess - Star Wars characters come to life in this fully animated chess game. Over 70 capture sequences. Allows for different skill levels.

CD Challenge Pack - 9 different game titles including RoboCop 3D and The Chessmaster 2100.



**VTECH®
expotech**

1-800-816-0070

CIRCLE 305 ON READER SERVICE CARD

Government & Education 1-800-947-6461.

VTech Computers, Inc., 800 Church Street, Lake Zurich, Illinois 60047 Fax 1-800-947-3976

Before You Buy

**TI
IBM
AST
NEC
COMPAQ
TOSHIBA**

Shop and Compare

Don't Settle for Less

PCs Complete	Supplier 2	Supplier 3
Guaranteed Lowest Price	YES	YES
The Best Brand Names	YES	YES
30-day Money Back Guarantee	YES	YES
Never a Restocking Fee	YES	YES
30-day Price Protection	YES	YES
PC Computing Five Star Award	YES	YES
Lifetime Toll-Free Technical Support	YES	YES
FREE Hardware Configuration	YES	YES
FREE Software Installation	YES	YES
Same Day Shipment	YES	YES
Pre-installed Software Optional	YES	YES
All Major Credit Cards Accepted	YES	YES
Never a Hidden Surcharge	YES	YES
\$4.95 Shipping on Most Peripherals	YES	YES
Compaq Authorized for Direct Marketing	YES	YES
90 Days Same As Cash	YES	YES
Low Cost Business Leases	YES	YES
Volume Purchase Agreements	YES	YES
FREE Asset Tagging	YES	YES
Customer Satisfaction Is Top Priority	YES	YES



PCs Complete is the proud recipient of PC Computing magazine's highest Five Star rating for service and overall performance in its listing of the nation's leading direct sellers.

PCs COMPLETE
THE BEST: BRANDS • PRICE • DELIVERY • SERVICE

Open 24 Hours
Weekend & Holiday
8:00am to 6:00pm EST

CALL TODAY!

800-775-4727

International (508) 624-6400

NEC: Versatility

UltraLite Versa E

- ▲ 486 processor
 - ▲ 4MB RAM, expandable to 20MB
 - ▲ 2 Type II PCMCIA slots
 - ▲ MS-DOS 6.2, Windows 3.1, built-in trackball
 - ▲ Removable hard drive
 - ▲ Removable floppy - add second battery
 - ▲ Removable screen
 - ▲ Pen upgradable
- | Processor | Screen | Hard Drive | Price |
|-----------|-----------|------------|--------|
| DX2/40 | 9.5" Act. | 120MB | \$3439 |
| DX2/40 | 9.5" Act. | 250MB | \$3669 |
| DX2/50 | 9.5" Act. | 209MB | \$3749 |
| DX4/75 | 9.5" Act. | 340MB | \$4529 |

Lease for \$120/mo.

UltraLite Versa V

- ▲ 486DX2/50
 - ▲ 4MB expandable to 20MB
 - ▲ 2 Type II PCMCIA slots
 - ▲ MS-DOS 6.2, Windows 3.1, built-in trackball
 - ▲ Removable hard drive
 - ▲ Removable floppy - add second battery
- | Screen | Hard Drive | Price |
|-------------|------------|---------|
| 9.5" Active | 250MB | \$2839* |
| 9.5" Active | 250MB | \$3619 |
| 9.5" Active | 340MB | \$3799 |
| 9.5" Active | 540MB | \$4279 |

Lease for \$104/mo.

UltraLite Versa S

- ▲ 486 processor
- ▲ 9.5" screen
- ▲ 2 Type II PCMCIA slots
- ▲ Only 4.2lbs. (mono)

Processor	Screen	Hard Drive	Price
486SX/33	9.5" M	210MB	\$1889*
486SX/33	9.5" D/S	210MB	\$2319
486SX/33	9.5" Act.	210MB	\$3219
486DX2/50	9.5" Act.	260MB	\$3689

Lease for \$69/mo.

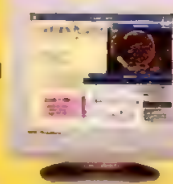
MultiSync Monitors

3V

- ▲ 15" SVGA
- ▲ 1024x768, .28mm NI
- ▲ 72MHz VESA refresh
- ▲ MPR II, EnergyStar

\$469.99

2V-14" SVGA-\$339.99
5FGp-17" SVGA-\$1109.99
6FGp-21" SVGA-\$2019.99



UltraLite Versa V

\$2839*



HOT PRODUCT

NEC

Hewlett Packard Power

LaserJet 4L

- ▲ 4PPM
 - ▲ Crisp, 300dpi print-quality
 - ▲ Resolution Enhancement Technology
 - ▲ 1-year warranty
- LaserJet 4L \$659.99



LaserJet 4L

LaserJet 4P

- ▲ 4PPM
 - ▲ Sharp, 600dpi print-quality
 - ▲ 2MB RAM w/Memory Enhancement Technology
 - ▲ 1-year warranty
- LaserJet 4P \$959.99

DeskJet/DeskWriter 310

- ▲ High quality 3 PPM printing
 - ▲ Low cost optional color kit
 - ▲ 1-Year warranty
- DeskJet 310 \$299.99
DeskWriter 310 \$299.99

DeskJet 500C

- ▲ Letter-quality 300dpi color printing
 - ▲ 100 Sheet feeder for versatile paper handling
 - ▲ 3-year warranty
- DeskJet 500C \$369.99

DeskJet/DeskWriter 520

- ▲ Sharp, 600x 300 dpi "laser-like" print quality
 - ▲ Resolution Enhancement Technology for smooth, crisp text and graphics
 - ▲ 3-Year warranty
- DeskJet 520 \$269.99
DeskWriter 520 \$269.99

DeskJet/DeskWriter 560C

- ▲ Color 600x 300 dpi "laser-like" print quality
 - ▲ Resolution Enhancement Technology for smooth, crisp text and graphics
 - ▲ 3-Year warranty
- DeskJet 560C \$569.99
DeskWriter 560C \$569.99



DeskJet 310

Ask about the new DeskJet 1200C!

hp HEWLETT PACKARD
Authorized Dealer

IBM® • IBM® • IBM®

ValuePoint® SpaceSaver Si

- ▲ 4MB RAM exp. to 64MB
- ▲ VESA Local Bus graphics
- ▲ 512KB Video RAM exp. to 1MB
- ▲ 3 expansion slots, 3 drive bays
- ▲ IBM DOS 6.1/MS Windows 3.1, mouse, enhanced 101 keyboard

Processor	Hard Drive	Price
486SX/25	120MB	\$929
486DX/33	212MB	\$1249
486DX2/66	212MB	\$1639

*monitor priced separately

ValuePoint® Performance

Go beyond the very edge of industry standards with the new ValuePoint Performance Series, featuring:

- ▲ 486DX/33, DX2/66, or DX4/100 processor, Pentium upgradable
- ▲ 4/8MB RAM exp. to 128MB
- ▲ 64-bit VESA Local Bus Graphics
- ▲ SelectaBus VESA or PCI Bus technology (interchangeable)
- ▲ Support for up to 4 IDE devices
- ▲ IBM DOS 6.3, MS Windows 3.11
- ▲ 3-Year Warranty

Call for models and prices!

**ValuePoint®
Performance**

**ThinkPad®
360**



ThinkPad 500 – IBM SLC2/50 486 – 170MB hard drive – \$999

ThinkPad® 360 notebooks

**HOT
PRODUCT**

- ▲ 486SL/33 processor
- ▲ 4MB RAM exp. to 20MB
- ▲ Modular design, removable hard drive & floppy drive
- ▲ Local Bus Graphics with 1MB video RAM
- ▲ 2 Type II or 1 Type III PCMCIA slot
- ▲ TrackPoint II integrated pointing device
- ▲ IBM DOS 6.3, Windows 3.1, Lotus cc:Mail, Organizer, ScreenCam, Official Airline Guide FlightDisk, CoSessions Host, Prodigy, America Online, and FaxWorks 3.0

▲ Port Replicator and Docking Station available

Screen	Hard Drive	Price
9.5" Monochrome	170MB	\$1939*
9.5" Monochrome	340MB	\$2419
9.5" Dual Scan	170MB	\$2519
9.5" Dual Scan	340MB	\$2999
8.4" Active Color	170MB	\$3389
8.4" Active Color	340MB	\$3869

ThinkPad® 510 subnotebook

**HOT
PRODUCT**

- ▲ IBM 486BL2/50 processor
- ▲ 4MB RAM exp. to 20MB
- ▲ 200MB hard drive
- ▲ 7.7" dual scan color
- ▲ Type II PCMCIA slot
- ▲ TrackPoint II integrated pointing device
- ▲ 3.5" external floppy drive
- ▲ Weighs only 3.8 lbs.
- ▲ IBM DOS 6.3, Windows 3.1, Lotus cc:Mail, Organizer, ScreenCam, Official Airline Guide FlightDisk, CoSessions Host, Prodigy, America Online, and FaxWorks 3.0

\$2319

All Compaq
Computers Come with
a 3-year Warranty

Compaq Compleat

Call About
New LTE Elite

Concerto

- ▲ 4MB RAM expandable to 20MB
- ▲ 9.5" mono display
- ▲ 2 Type II or 1 Type III PCMCIA slots
- ▲ Untethered intelligent pen
- ▲ MS-DOS 6.0, Windows 3.1, InkWare NoteTaker

Processor	RAM	Hard Drive	Price
486SL/25	4MB	120MB	\$1229*
486SL/25	4MB	250MB	\$1319
486SL/33	4MB	250MB	\$1399

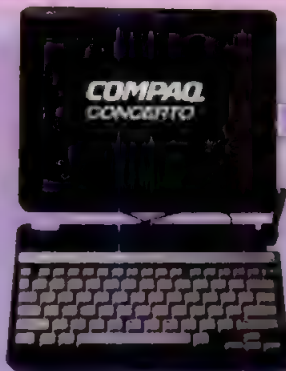
Lease for \$50/mo.

Contura Aero

- ▲ Type II PCMCIA slot
- ▲ Integrated trackball
- ▲ Weighs only 3.5 lbs. (mono), 4.31 lbs. (color)
- ▲ MS-DOS, Windows 3.1

Processor	Display	Hard Drive	Price
486SX/25	8.0" Mono	87MB	\$999
486SX/25	8.0" Mono	170MB	\$1419
486SX/33	7.8" Passive Color	170MB	\$1989
486SX/33	7.8" Passive Color	250MB	\$2269

Lease for \$50/mo.



**Concerto
\$1229***

Contura 4/25

- ▲ 486SL/25 processor
- ▲ 4MB RAM expandable to 20MB
- ▲ 209MB hard drive
- ▲ Available with monochrome, dual scan or active matrix color display
- ▲ MS-DOS 6.0, Windows 3.1, trackball

Screen	Price
9.5" Monochrome	\$1989
9.5" Dual scan color	\$2319
9.5" Active matrix color	\$2839

ProLinea Desktops

- ▲ 4MB RAM expandable to 100MB
- ▲ 3.5" floppy drive
- ▲ Local bus graphics
- ▲ Pentium upgradable
- ▲ Energy Star compliant
- ▲ MS DOS 6.0, Windows 3.1

Processor	RAM	Hard Drive	Price
486SX/33	4MB	200MB	\$1099
486SX/25	4MB	200MB	\$1219
486DX2/66	4MB	340MB	\$1769
486DX2/66	4MB	525MB	\$1969
486DX4/100	8MB	340MB	\$2299
486DX4/100	8MB	525MB	\$2469

*Compaq color monitors start at \$259.99

CIRCLE 092 ON READER SERVICE CARD

PCs COMPLEAT
THE BEST: BRANDS • PRICE • DELIVERY • SERVICE

Open 24 Hours
Weekdays

Weekends & Holidays
8 A.M. to 5 P.M. E.T.

CALL TODAY!

800-775-4727

International (508) 624-6400

COMPAQ

© PCs Compleat. All prices subject to change and do not include shipping. Monitors sold separately. Lease prices reflect 36 month operating lease to approved business customers. All products or brand names are trademarks of their respective companies. PCs Compleat, 34 St. Martin Drive, Marlborough, MA 01752. Phone (508) 624-6400. Not responsible for typographical errors.

Toshiba Direct

T3400

- ▲ Ultra-portability at only 4.1lbs
- ▲ 486SX/33 processor
- ▲ 120MB hard drive
- ▲ 4MB RAM, expandable to 20MB
- ▲ PCMCIA Type II slot
- ▲ External 3.5" disk drive
- ▲ Integrated AccuPoint pointing device

Processor	Screen	Hard Drive	Price
486SX33	8.4" Mono	120MB	\$1179*
486SX33	7.8" Active	120MB	\$2299
486SX33	7.8" Active	250MB	\$3389
486DX2/50	8.4" Active	250MB	\$4069

Lease for \$62/mo.

\$1179*



T3400

T4700 and T4800

- ▲ 8MB RAM, expandable to 24MB
- ▲ Brilliant 9.5" display with local bus video
- ▲ 2 PCMCIA slots (Type II, Type III)
- ▲ Microsoft Sound System, built-in microphone, audio out port
- ▲ MS-DOS, UltraFont, Indeo video compression software, Windows for Workgroups 3.11

Model	Processor	Screen	Hard Drive	Price
T4700	486DX2/50	9.5" Dual scan	200MB	\$3129*
T4700	486DX2/50	9.5" Dual scan	320MB	\$3379
T4700	486DX2/50	9.5" Active	200MB	\$4549
T4700	486DX2/50	9.5" Active	320MB	\$4899
T4800	486DX4/75	9.5" Active	500MB	\$5599

Lease for \$114/mo.

T2400

- ▲ 486DX2/50 processor
- ▲ 2 PCMCIA slots (Type II, Type III)
- ▲ Integrated AccuPoint pointing device
- ▲ Optional sound card
- ▲ MS-DOS, Windows for Workgroups

Screen	Hard Drive	Price
9.5" Dual Scan	250MB	\$2929*
8.4" Active Color	250MB	\$3639
8.4" Active Color	320MB	\$3799

Lease for \$107/mo.



T1960

\$2379*

Satellite Notebooks

- ▲ 4MB RAM, expandable to 20MB
- ▲ 9.5" display
- ▲ Type III PCMCIA slot
- ▲ 82-key keyboard
- ▲ MS-DOS, Windows 3.1
- ▲ Ballpoint mouse with Quickport
- Enhanced power management

HOT PRODUCT

Model	Processor	Screen	Hard Drive	Price
T1910	486SX/33	9.5" Mono	200MB	\$1499
T1910	486SX 33	9.5" Dual scan	200MB	\$2039
T1950	486DX2/40	9.5" Dual scan	200MB	\$2289
T1950	486DX2/40	8.4" Active	200MB	\$2929
T1950	486DX2/40	8.4" Active	320MB	\$3199
T1960	486DX2/50	9.5" Dual scan	200MB	\$2379*
T1960	486DX2/50	8.4" Active	200MB	\$3029
T1960	486DX2/50	8.4" Active	320MB	\$3259

Lease for \$55/mo



T2400

\$2929*



T4700

\$3129*

TOSHIBA

PCs COMPLEAT
THE BEST: BRANDS • PRICE • DELIVERY • SERVICE

Open **24 Hours**
7 days a week
Weekend & Holiday

CALL TODAY!

800-775-4727

INTERNATIONAL

508-624-6400



**XJACK
14.4/14.4
MODEM
\$229.99**

Model	Description	Price
XJ2144	14.4/14.4 XJACK GOLD	\$259.99
CC4144	14.4/14.4 PCMCIA GOLD	\$259.99
XJ1144	14.4/14.4 XJACK	\$229.99
CC3144	14.4/14.4 PCMCIA	\$229.99
XJ196FM	96/96 XJACK	\$179.99
XJ124FM	24/96 XJACK	\$99.99
P2144	14.4/14.4 Pocket	\$239.99

Megahertz

**Luxurious
Leather**

\$99.99



Additional styles and colors available

**Premier
Leather**

\$139.99

TARGUS
A TRADITION OF EXCELLENCE

**Lifetime
Replacement
Warranty**

Epson

Stylus Color 240cps, 720dpi with special paper	\$599.99
Stylus 800 180cps, 360dpi 100 Sheets	\$269.99
ActionLaser 1500 6PPM 300dpi	\$649.99
ActionLaser 1600 6PPM 600dpi	\$989.99

Philips

17" SVGA 1600x1280ni, 27mm	\$979.99
21" SVGA 1600x1280ni, 28mm	\$2699.99

Magnavox

14" SVGA 1024x768ni, 28mm	\$299.99
15" SVGA 1280x1024ni, 28mm	\$369.99

Maxtor

105MB PCMCIA Drive, Type III	\$359.99
131MB PCMCIA Drive, Type III	\$389.99
345MB IDE Drive	\$219.99
546MB IDE Drive	\$319.99

AST

Texas Instruments

Ask about the New
SX2/50 4000M
Models

Bravo LC Desktops

New Generation!

- ▲ 4/8MB RAM exp. to 64MB
- ▲ VESA local bus graphics
- ▲ 1MB video RAM
- ▲ MS-DOS 6.2, Windows 3.1
- ▲ Energy Star Compliant

Model	RAM	Hard Drive	Price
4/33s Model 173W	4MB	170MB	\$1099
4/33s Model 273W	8MB	270MB	\$1369
4/33 Model 173W	4MB	170MB	\$1369
4/33 Model 273W	8MB	270MB	\$1599
4/50s Model 173W	4MB	170MB	\$1249
4/50s Model 273W	8MB	270MB	\$1509
4/66d Model 273W	8MB	270MB	\$1779
4/66d Model 543W	8MB	540MB	\$2039
4/100t Model 273W	8MB	270MB	\$2149
4/100t Model 543W	8MB	540MB	\$2299

Lease for \$50/mo.

Bravo MT

- ▲ 2/4/8MB RAM exp. to 64MB
- ▲ Optional 170/340MB hard drive
- ▲ 32-bit accelerated local bus graphics

Model	Hard Drive	Price
4/66d Model 3	Optional	\$1369
4/66d Model 173W	170MB	\$1639
4/66d Model 343W	340MB	\$2049

Lease for \$83/mo.

Ascentia 800N

- ▲ 486SX/33 or DX/50 processor
- ▲ 4MB RAM expandable to 20MB
- ▲ 9.5" Dual scan color display
- ▲ PCMCIA Type III slots

Model	Hard Drive	Price
4/33s Model 253W	250MB	\$2299
4/33s Model 343W	340MB	\$2499
4/50d Model 253W	250MB	\$2599
4/50d Model 343W	340MB	\$2739

Lease for \$84/mo.

Ascentia 900N

- ▲ 486DX2/50 or 486DX4/75 processor
- ▲ 4MB/8MB RAM exp. to 24MB
- ▲ Large dual scan or active color displays
- ▲ PCMCIA type III slot

Model	Screen	Hard Drive	Price
4/50 Model 253W	9.5" Dual Scan	250MB	\$1979
4/50 Model 343W	10.3" Dual Scan	340MB	\$2329
4/50 Model 343W	9.5" Active	340MB	\$2869
4/75 Model 343W	9.5" Dual Scan	340MB	\$1969
4/75 Model 513W	10.4" Active	510MB	\$5799

Lease for \$83/mo.



Ascentia 900N
\$2979

CD-ROM Docking System

Transform your TravelMate 4000M into the Ultimate Mobile Multimedia System with the Portable CD-ROM docking system

- ▲ Double-speed CD-ROM drive
- ▲ 250ms access time
- ▲ Built-in speakers
- ▲ SCSI II connector

\$81999*

TravelMate 4000M

- ▲ Brilliant color display
- ▲ 16-bit sound card
- ▲ Integrated pointing device
- ▲ PCMCIA Type III slot

Processor	Screen	Hard Drive	Price
486SX/25	8.2" Enhanced	120MB	\$2099
486SX/25	8.4" Active	200MB	\$2929
486SX2/50	9.5" Dual Scan	200MB	\$2759
486SX2/50	8.4" Active	340MB	\$3349
486DX4/75	8.4" Active	340MB	\$3119

TravelMate Intelligent Docking System

- ▲ 6 16-bit ISA slots
- ▲ 2 PCMCIA Type III slots
- ▲ 2 3.5" and 2 5.25" drive bays
- ▲ Auto Load/Eject feature

\$79999*

TravelMate 4000E Color

Processor	Screen	Price
486SX/25	8.2" Enhanced Color	\$1699
486DX2/40	8.2" Enhanced Color	\$2069
486DX2/50	9.4" Dual Scan	\$2319
486DX2/50	8.4" Active Matrix	\$2819
486DX4/75	8.4" Active Matrix	\$3549
486DX4/75	9.5" Active Matrix	\$4489



TM 4000E
\$2099

PC
EDITORS
CHOICE

Zenith Data Systems

Z-NOTEFLEX

Multimedia Notebook

The Z-NOTEFLEX family from Zenith Data Systems is an exciting new class of notebook PC which unites leading edge modular design with powerful computing, communications and multimedia capabilities.

- ▲ User upgradable processor, memory, hard drive, display and more
- ▲ 4MB RAM exp. to 24MB
- ▲ 200/340/450/520MB removable hard drive
- ▲ 32-bit VL local bus video
- ▲ Detachable video display
- ▲ Integrated trackball
- ▲ Two Type II or one Type III PCMCIA slot
- ▲ MS-DOS, Windows for Workgroups
- ▲ 3-year warranty

Processor	Screen	Hard Drive	Price
486SX/33	10.4" mono	200MB	\$2449
486DX2/50	10.3" dual scan	200MB	\$3649
486DX2/50	9.5" active	340MB	\$4719*
486DX2/50	9.5" active	450MB	\$5069
Intel DX4/75	9.5" active	520MB	\$5339

\$4719*



FLEXBAY

Does double duty as a battery charger or external floppy drive bay.

Port Replicator

Optional PCMCIA and Ethernet connectors available

FLEXSITE LCD Display Stand

Extend your viewing options up to 3 feet on your desk.

PCM-9/94 B

PCs COMPLEAT
THE BEST: BRANDS • PRICE • DELIVERY • SERVICE

Open 24 Hours
7 days a week

Weekends & Holidays
8:00am - 6:00pm, E.T.

CALL TODAY!

800-775-4727

International (508) 624-6400

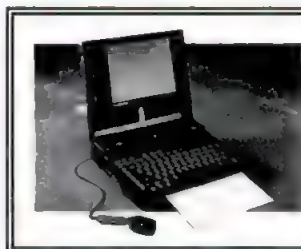
ZENITH
DATA SYSTEMS

CIRCLE 268 ON READER SERVICE CARD

BULLDOG COMPUTER PRODUCTS RECEIVED PC COMPUTING'S

★★★★★ MAIL ORDER AWARD!!!

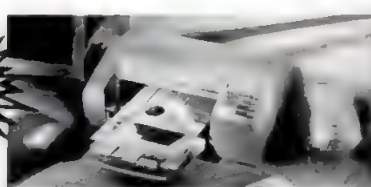
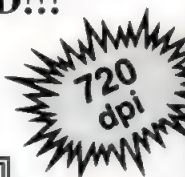
Call 1-800-438-6039



Canon

NOTEJET 486 - SLC/33

- 486 SLC/33 Mhz
- Built-In "Bubble Jet" Printer
- 120 MG • \$1849 • 200 MG • \$1929
- Dual Scan Color!
- 120 MG • \$2439 • 200 MG \$2499



Epson Stylus Color - \$549



BULLDOG

COMPUTER PRODUCTS

Network

3 Com	
3C503-16/5-pack	155/719
3C507 Etherlink 16	279
3C579 Ethernet EISA	229
3C509 Etherlink 3	109
3C509-5 Pack	469
3C509-20 Pack	1599
ARTISOFT	
Star Kit 3mbps/AE2	325/429
LAN Cards 3mbps/AE2	129/179
Noderunner Si2000	85
Star Kit 6.0	299
Lantastic 5/10 User	329/569
2000/C add on Kit	159

INTEL	
Ether Express 16/16TP	89
Ether 16-5 Pack	429
Ether 16-20 Pack	1579
Ether Flash	89
Ether Flash 5 Pack	479
Ether Flash 20 Pack	1799
Ether Combo/5 Pack	115/509
Token Express 16/5	329
Netport EL/XL	359/399

NOVELL	
NE2000/5 Pack	69/329
NE3200	419
Novell Lite 1.1/starter kit	69/409
Network 2.2 5/10 User	569/1289
Network 3.12 5/10 User	579/1295
Network 3.12-25 User	1869
Network 3.12-50 User	2349
Network 3.12-100 User	3399
Network 4.0-5/10 User	719/1599
Network 4.0-25 User	2299
Network 4.0-50 User	3199

SMC	
PC130/PC130E	75/99
PC600WS/PC600FS	129/199
Ethercard 8 bit/16 bit	89/99
10 Base-T Card 8 bit/16 bit	99/99
3608TP 10BT concentrator	279
3512TP Ether 10BT conc. 12 port	509

XIRCOM	
Pocket Ethernet PE3-10B	249
Pocket Ethernet PE3-10BT	249
Parallel Port Multiplexor	79
Aldus Pagemaker 5.0	499

Software

Carbon Copy/Close UP	129/119
Clarion ProDeveloper	299
Corel Draw 4.0 3-1/2"CD	359/279
Dbase IV V.2.0	379
FoxPro 2.6 Pro Windows	415
FrameMaker	499
Freelance Plus 4.0	299
Harvard Graphics 2.0/3.0	149/359
Lotus 2.4/3.4	275/325
Lotus for Windows 4.0	279
Smart Suite Bundle	379
MS Dos 6.2	79
Microsoft Windows 3.1	79
Microsoft Windows N/T	309
Microsoft Windows for Workgroup	139
Microsoft Access 1.0 for Windows	299
Microsoft Excel 4.0 for Windows	299
Microsoft Office	439
Microsoft Office Pro	509
Microsoft Word for Windows 6.0	289
Norton Utilities 8.0	105
Peachtree III Complete DOS	179
Paradox v4.0	519
Q&A 4.0	169
Winfax Pro	79
Word Perfect 6.0A	249
Word Perfect for Windows	268
Word Perfect 6.0 Upgrade	99

Chips

1 mg/4mg Simms	45/149
HP 4mg/8 mg	159/319
Cyrix DRX2-20/40	219
Cyrix DRX2-25/50	299
Cyrix 33/66	319
Intel 387 SX or DX	85
Intel Overdrive	
SX 50-Double 20-25 Mhz	179
DX2 50-Double 20-25 Mhz	225
DX2 50-Double 33 Mhz	289

Monitors

NEC MULTISYNC	
3FGE/3V	549/459
4FGE	589
5FGE	969
5FGP	1079
6FGP	1949

CTX	
1562 15" SVGA	319
6468/1451	229/249
1765 GM 17" SVGA	665

MAQ	
LX 1450 14"	249
DX/MX15F 15"	349/459
DX/MX17F 17"	659/779
MX21F	1759

NAHAO	
F760/W	1965
F550V/F550W	899/979
F560W/T560	1229/1459
F340W/T660	649/2049

VIEW SONIC	
1517G	429/779
17	879
20/21	1499/1679

Modems & Fax

BOCA	
14.4 Fax Modem Int/Ext	85/109
28.8 Int/Ext	179/219
Pocket 14.4	159
CARDINAL - 14.4 Int/Ext	89/139

QVC	
14.4 Int/Ext w/Fax	79/89
28.8 Int/Ext w/Fax	175/185

HAYES	
Optima 96	319
Optima 14.4 Ext/Int	349
PCMCIA 14.4	259
Pocket 14.4	289
Optima 28.8 Int/Ext	349/399
Accura 14.4 Fax Int/Ext	119/139

Accura	
28.8	
Ext	
255	
INTEL	



14.4/14.4 Fax Int/Ext	89/109
PC MCIA 24/96	129
PC MCIA 14.4/14.4 Fax	189
Satisfaction 400/400E	259/289

PRACTICAL PERIPHERALS	
ProClass 14.4 Int/Ext	149/169
PP 14400 Fax Int/Ext	105/119
28.8 Int/Ext	219/229
Pocket 14.4/28.8	259/369
PCMCIA	265

US ROBOTICS	
Sportster 14.4 Int	109
Sportster 14.4 Fax/Int	115

Printers

CANON	
BJ10sx - After Rebate	209
BJ200E - After Rebate	249
BJ230 - After Rebate	359
BJC600 - After Rebate	529
LBP-430 - After Rebate	545
LBP-860-600 dpi - After Rebate	1069
BJ-800 - After Rebate	1419

EPSON	
LX300	169
AP3250	169
AP3260	175
FX870	259
FX1170	345
LQ570	235
Action Laser 1500	639
Action 1500-2 MG	699
Action 1100/1600	479/929
Stylus 400 Inkjet	229
Stylus 800	239
Stylus 1000	429
Stylus Color	549

HEWLETT-PACKARD	
Laserjet IV/IV+	1299/1429
Laserjet IVM+ w/toner	1949
Laserjet IVL	675
Laserjet IVP	959
Laserjet IVMP	1369
Laserjet IVML	1039
HP IVsi	2989
Deskjet 550c	429
Deskjet 520/560c	289/569
HP Deskjet 1200c	1399
HP Deskjet 1200c/ps	2199
Upgrade for HP 1mb	79
Upgrade HP 2mb/4mb	99/159
Jet Direct 2550A	359

OKIDATA	
ML184/380	219/205
ML320/321	295/415
ML520/521	365/489
ML590/591	409/559
395/395c	949/1029
Laser 400E/810	495/899
Laser 410E-600 DPI	645
830/850	1189
PM3410	1199

TEXAS INSTRUMENTS	
Microwriter PS23	675
Microwriter Pro PS23	1329

PANASONIC	
2023/2130	179/199
1624/2124	379/295
2624 24 pin wide	369
4410 laser/4430	449/639
4440/5400	989/779

Scanners & Misc.

Canon 1 x 4015 Scanner	899
Epson Scanning 800	749
Epson 800	895
Logitech 256 w/OmniPage	169
HP Scanjet IIP w/interface	489
HP Scanjet IIC w/interface	949
Summasketch 12 x 12	255

AMERICAN POWER	
Back-ups 250/400/450	99/159/189
Back-ups 600/900	259/369

3241 E Washington Rd.
Martinez, GA 30907



BULLDOG
COMPUTER PRODUCTS

Notebooks

CANON	
486 SLC/25, 120 mg	1199
486 SLC/25, 120 mg-color	1749
Notejet 486 w/printer-120 mg	1849
Notejet 486 w/printer-200 mg	1929
Notejet II 50 Mhz-130 mg	2789
Notejet II 50 Mhz-260 mg	2939
EPSON	
486 SLC50/260 mg	1499
SHARP	
PC8650/PC8650II	2599/2749
TEXAS INSTRUMENTS	
4000 DX2/50 W/200	2279
4000 DX2/50E Active Color	2829
486/DX4/75	3549

Drives

CONNER	
212 mg/540 mg	169/319
IOmega	
Transportable 150	559
Insider 150	459
Tape 250 mg insider	179
Tape 250 mg ext	319
21MG Floptical Insider	349
MAXTOR	
7213A 210 IDE	189
7245A 245 IDE	219
7345A 345 IDE	249
SEAGATE	
ST3243A 213 mg	179
ST3391A 260 mg	239
ST1480A 420 IDE	259
ST3491A 452 mg	249
ST3655A 528 mg	329
FLOPPY DRIVES	
1.2 MB/1.44 MB	49/39
Micro Solutions 1.2 MB/1.44 MB	169
Dual Floppy Drive	99

Tape Drives

CONNER - 250	149
COLORADO MEMORY SYSTEMS	
DJ10 120 Meg Int Jumbo	119
DJ20 250 Meg Int Jumbo	159
Trakker 250	299
2120 Formatted Tape	17
MICRO SOLUTIONS	
80/250 Backpack	339
CD-2x	369
Back Pack 210 MG Drive	359

CD Rom

NEC 3X6/3X1	429/399
NEC 3XP/4X Pro	379/869
Textel 3028-Int-DS	259
Textel 5028-Ext-DS	329
Chinson 535 Int	299
Chinson 535 Ext	389

NO CHARGE FOR CREDIT CARDS!

Open Weekdays: 9:30 a.m. to 8:30 p.m.
Saturday 9:00 a.m. to 5:00 p.m.
(708) 860-7364 • Fax (708) 860-7356
Shipping (708) 228-6368





PUBLISHER'S TOOLBOX



CALL PUBLISHER'S TOOLBOX: 1-800-756-2250 TO ORDER or ORDER BY FAX: 800-828-1112

PUBLISHING

☐ = Windows Application	
Adobe	
☐ Photoshop	549 ⁹⁵
☐ Photoshop & Illustrator	639 ⁹⁵
☐ Premiere	199 ⁹⁵
☐ DSP Accelerator	349 ⁹⁵
☐ Typemanager/Typebasics	399 ⁹⁵ /129 ⁹⁵
Aldus	
☐ Freehand 4.0 (New!)	375 ⁹⁵
☐ Gallery Effects Vol. 1, 2, 3	ea 133 ⁹⁵
☐ Pagemaker 5.0	529 ⁹⁵
☐ Photostyler 2.0 (Special!)	299 ⁹⁵
Clip Art	
Masterclips CD/Disk	99 ⁹⁵ /109 ⁹⁵
Publisher's Task Force	49 ⁹⁵
Presentation Task Force	89 ⁹⁵
Corel	
☐ CorelDRAW! 5.0 Disks/CD	569 ⁹⁵ /449 ⁹⁵
☐ CorelDRAW! 4.0 Disks/CD	359 ⁹⁵ /255 ⁹⁵
☐ CorelDRAW! 3.0 Disks/CD	128 ⁹⁵ /99 ⁹⁵
☐ Upgrade 3 to 5 Disks/CD	329 ⁹⁵ /419 ⁹⁵
☐ Upgrade 4 to 5 Disks/CD	229 ⁹⁵ /179 ⁹⁵
☐ Corel Gallery/Corel Flow	39 ⁹⁵ /75 ⁹⁵
☐ Corel Photo CDs	ea 19 ⁹⁵
Publishing Standards	
☐ Andromeda Filters Series 1 & 2	ea 79 ⁹⁵
☐ Designer 4.0/Upgrade	459 ⁹⁵ /195 ⁹⁵
☐ Elastic Reality	169 ⁹⁵
☐ Fractal Painter 2.0/X2	259 ⁹⁵ /89 ⁹⁵
☐ Image Pals 2	125 ⁹⁵
☐ Macromodel/Director	659 ⁹⁵ /399 ⁹⁵
☐ Multimedia Toolbook 3.0	675 ⁹⁵
☐ Ofoto 2.0 (Color)	199 ⁹⁵
☐ Photo Morph	89 ⁹⁵
☐ Pixar Typestry	169 ⁹⁵
☐ QuarkXPress 3.3	599 ⁹⁵
☐ Truespace	495 ⁹⁵
☐ Visual Reality	559 ⁹⁵
☐ Zscript/Superprint	265 ⁹⁵ /89 ⁹⁵
Publishing Utilities	
☐ Hijaak Pro 2.0	79 ⁹⁵
☐ Mac-in-Dos/Plus	99 ⁹⁵ /149 ⁹⁵
☐ Omnipage Pro 5.0 (Special!)	439 ⁹⁵
☐ TextBridge	79 ⁹⁵
☐ Wordscan/Wordscan+ 3.0	179 ⁹⁵ /389 ⁹⁵
☐ Winfax Pro 4.0/Network	77 ⁹⁵ /269 ⁹⁵
☐ Uninstaller	45 ⁹⁵
Typography	
Adobe Type Library in Stock!	
☐ Volumes 1-380 (Special!)	CALL
☐ Fontographer/Fontomatic	249 ⁹⁵ /39 ⁹⁵
☐ FontChameleon	159 ⁹⁵
☐ FontMinder	49 ⁹⁵
☐ Monotype FontFont CD (8 Free!)	39 ⁹⁵
Microsoft	
☐ Excel 5.0/Upgrade	299 ⁹⁵ /125 ⁹⁵
☐ Multimedia Viewer	325 ⁹⁵
☐ Office 4.2/Upgrade	459 ⁹⁵ /275 ⁹⁵
☐ Publisher 2.0	89 ⁹⁵
☐ Visual Basic Pro	309 ⁹⁵
☐ Windows 3.1/Upd d/NT	95 ⁹⁵ /53 ⁹⁵ /295 ⁹⁵
☐ Word 6.0/Upgrade	299 ⁹⁵ /125 ⁹⁵
☐ All Products	CALL

TABLETS

Accelad	
☐ Accelad 5x5	119 ⁹⁵
Calcomp	
☐ 6x9/12x12 Pressure Sens	279 ⁹⁵ /399 ⁹⁵
Kurta	
☐ XGT 12x12	219 ⁹⁵
Summagraphics	
☐ All Tablets	CALL
☐ 6x9 w/Dabblor	SPECIAL

Wacom New UD Series

High Resolution Tablets for Graphic Designers with Pressure Sensitive Pen

4 x 5 ArtPad	\$1,450 ⁹⁵
8 x 9 ArtZ	\$3,490 ⁹⁵
12 x 12	\$5,390 ⁹⁵
12 x 18	\$7,290 ⁹⁵

GRAPHICS SOLUTIONS



"The Nokia Multigraph 447X's supremely sharp picture and clever on screen menu controls make it a winning choice among 17-inch color display." *PC Magazine*

The 447X boasts a 17" Trinitron tube with a .25 dot pitch. It supports a bandwidth of 140 MHz and 1280 x 1024 resolution at 74 Hz with a maximum of 1600 x 1200 at 60 Hz. There are 19 on screen adjustments including "Full Screen" borderless display, color temperature and RGB control. It is Energy Star and MPRII compliant and comes with a 3 year parts and labor warranty.



This is a painting program and an image-editor all in one! Based on a set of software brushes that emulate traditional media—pencils, pastels, pens, charcoal, watercolors, oils and more these brushes look and feel like their real counterparts. Image-editing features include keeping multiple floating selections active at once plus lots of simple shortcuts for common operations.



No matter what kind of graphics or imaging you may want to produce, Kai's Power Tools will immediately accelerate your ability to produce stunning imaging and graphics. Create a limitless range of textures and effects, stunning graphics—fast and easy. The KPT preview windows provide you with real time feedback.

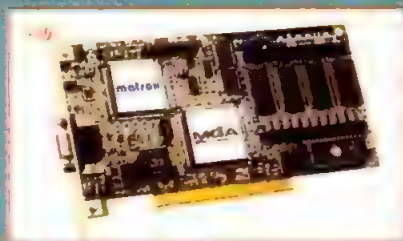
Video Cards

	VLB & PCI
ATI	
Graphics Pro Turbo, 2/4 MB	399/619
DIAMOND	
Stealth 64, 2/4 MB	349/499
Stealth 32, 1/2 MB	189/239
HERCULES	
Dynamite Pro*, 1/2 MB	159/199
Graphite Power*, 1/2 MB	239/349
MATRIX	
Impression/Pro*, 3/4 MB	775/1189
Ultima Plus, 2/2+ MB	439/479
Ultima Plus 200, 4 MB	850
NUMBER 9	
GXE 64 Pro, 2/4 MB	349/569
GXE 64, 1/2 MB	179/249

*ISA and EISA version: CALL



The Nikon Coolscan is the first full-color, single pass scanner of its kind! Patented, solid-state illumination technology makes it exceptionally compact and quiet with low power consumption. Not only can it scan color or monochrome, positive or negative film, but it will achieve high resolution scans up to 2700 dpi, delivering sharp detail and vivid colors to all your scans! The unique combination of Coolscan's optical definition, color sensitivity and reliability makes it the new standard of quality and value in desktop film scanners. Int/Ext.



MGA Impression Plus is a low-cost solution for Windows, video playback and 3D graphics acceleration. Based on Matrox's award-winning 64-bit graphics chip, MGA Impression Plus incorporates true color acceleration 3D capabilities, DCI software video acceleration and upgradability to the VM-Channel and VideoLogic's PowerPlay64 video accelerator chip. With resolution support up to 1600 x 1200 in 256 colors, 1280 x 1024 in 16.7M colors and 120 Hz flicker-free displays at 1024 x 768, MGA Impression Plus is the all-purpose accelerator for both business and home use.

ORDERING/SHIPPING INFORMATION

- ☐ Visa, MasterCard, Discover & American Express Accepted. No Surcharge. Your credit card is not charged until the order is shipped.
- ☐ Corporate purchase orders are subject to credit approval.
- ☐ C.O.D. add \$5.00. Certified bank check, money order or cashier's check \$500.00 maximum.
- ☐ No sales tax (WI residents add 5.5%).
- ☐ All prices subject to change without notice.
- ☐ All items subject to availability.
- ☐ Hardware replaced or repaired at our discretion. All software and hardware is subject to manufacturer's warranty.
- ☐ We accept University & Government purchase orders.
- ☐ All returns must be in the original packaging and have a return authorization number.
- ☐ A restocking fee may apply.
- ☐ Overnight: all software and light hardware up to 5 pounds add \$5.95. Add \$1.00 per pound thereafter. We ship Airborne Overnight unless UPS Ground delivers the next day.
- ☐ \$3.00 UPS Ground per order hardware over 15 pounds is shipped and charged at standard UPS Ground rates.
- ☐ International & Canadian orders welcome!

Int: _____ Canada: _____

Germany: _____ Denmark: _____

Norway: _____ Belgium: _____

Switzerland: _____ FINL: _____

PUBLISHER'S

Publisher's Toolbox: 8045 S. Greenwood Dr., Suite 9, Middleton, Wisconsin 53562, Newark, Minn. - Fri. 8 a.m. - 7 p.m., Sat. 9 a.m. - 5 p.m. central time, 20194 Publisher's Toolbox Inc.

SCANNERS

Canon	
☐ I/X4015	975 ⁹⁵
Hewlett Packard	
☐ Scanjet IIP/IICX	499 ⁹⁵ /939 ⁹⁵
Logitech	
☐ Easy Touch	199 ⁹⁵
Microtek	
☐ IIG/ISP	489 ⁹⁵ /1075 ⁹⁵
☐ IISPI/IIHR	899 ⁹⁵ /775 ⁹⁵
☐ ScanMaker III (36-bit)	249 ⁹⁵
Nitoni	
☐ Coolscan Int/Ext	1729 ⁹⁵ /1959 ⁹⁵
Tamarack	
☐ 600/800 dpi (While they last!)	449 ⁹⁵ /499 ⁹⁵
Umax	
NEW PRODUCT PowerLook	
☐ UC 630LE/UC 630 Pro	599 ⁹⁵ /749 ⁹⁵
☐ UC 840/Vista	899 ⁹⁵ /499 ⁹⁵
☐ UC 1260/UC 1200SE	1199 ⁹⁵ /2399 ⁹⁵

PRINTERS

Canon	
☐ BJ200E/BJC600	289 ⁹⁵ /589 ⁹⁵
Fargo	
☐ Primera/Primera Pro	1475 ⁹⁵
Printer Supplies	
☐ CALL	
Hewlett Packard	
☐ LaserJet 4+, 4M+, 4L, 4P, 4MP	CALL
☐ DeskJet 560c/1200c	SPECIAL
☐ Memory Postscript SIMM	CALL
Lasermaster	
☐ Winjet 600/1200+	469 ⁹⁵ /699 ⁹⁵
Newgen	
☐ Imager Plus 6, 6L, 12	CALL
XLI	
☐ LaserJet 5.0	1179 ⁹⁵

MONITORS

Nannin	
☐ F550w/F550w/F560w	959 ⁹⁵ /1049 ⁹⁵ /1299 ⁹⁵
Nokia	
☐ 445M/445X	2059 ⁹⁵ /2575 ⁹⁵
☐ 449E/447B/447L	549 ⁹⁵ /979 ⁹⁵ /CALL
Viewsonic	
☐ 15"/17"/21"	489 ⁹⁵ /949 ⁹⁵ /1789 ⁹⁵

MULTIMEDIA

Acoustic Research	
☐ AR Partner 570/622	269 ⁹⁵ /199 ⁹⁵
Creative Labs	
☐ Soundblaster 16 SCSI/ASP	179 ⁹⁵ /209 ⁹⁵
☐ Soundblaster 32 AWE	265 ⁹⁵
☐ Videoblaster SE/Videospigot	ea 239 ⁹⁵
Pioneer	
☐ DRM 604X (6 CD Changer)	1075 ⁹⁵
Plextron	
☐ 4Plex Int/Ext	529 ⁹⁵ /675 ⁹⁵
Tek	
☐ Superquad CD-Rom	479 ⁹⁵
Turtle Beach	
☐ Multisound Monterey/Tahiti	349 ⁹⁵ /269 ⁹⁵
☐ Wave/Mau/Wavetable	70 ⁹⁵ /159 ⁹⁵
Yamaha	
☐ 10 Watt Speakers	75 ⁹⁵
☐ Quad Speed Recorder	679 ⁹⁵

REMOVABLE STORAGE

Adaptec	
☐ 1542CF/2842A/2940	263 ⁹⁵ /279 ⁹⁵ /319 ⁹⁵
Imreaga	
☐ Bernoulli Insider 150	479 ⁹⁵
☐ Transportable Multidisk 150	559 ⁹⁵
☐ All cartridges	CALL
Pinnacle Micro	
☐ Sierra 1.3 GB	289 ⁹⁵
☐ Tahoe 230	1175 ⁹⁵
Syquest	
☐ Sydos 88 meg Int/Ext	399 ⁹⁵ /489 ⁹⁵
☐ Sydos 200 meg Int/Ext	495 ⁹⁵ /569 ⁹⁵
☐ Sydos 270 meg Int/Ext	509 ⁹⁵ /609 ⁹⁵
☐ Syquest cartridges	CALL

BEST PRICES IN TOWN • (800) 831-8808

• 3-Year Parts Limited Warranty on Basic System* • Lifetime toll-free Technical Support
• 24-Hour BBS Support

DEE ONE SYSTEMS MONTHLY SPECIALS

SUPER SALE	MOTHERBOARD	RAM	CD-ROM	MONITOR	*BASIC SYSTEM	*BASIC SYSTEM
PENTIUM - 80/250C VLB-PCI	\$388	\$1,038			Call	\$1,718
PENTIUM - 80/250C VLB	318	898			Call	1,678
PENTIUM - 80/250C VLB	288	738			Call	1,418
PENTIUM - 80/250C VLB	208	828			Call	1,308
IBM 486SX-75/250C VLB	N/A	388			878	988
IBM 486SLC2-66/84C VLB	N/A	198			788	878
486DX4-100/120C VLB	108	888			1,238	1,348
486DX2-66C VLB	74	288			858	968
486DX2-50C VLB	74	228			788	888
486DX-40C VLB	74	188			788	878
486DX-33C VLB	74	188			758	868
486SX-25C VLB	74	138			708	818
486DL-40/120C VLB	88	148			718	828
486DX2-80/120C NICE EISA VLB	188	468			1,038	1,148
486DX2-66/120C EISA VLB	128	388			968	1,078
486DX-33/120C NICE EISA VLB	188	428			838	1,108
486DX2-66C ISA	84	278			848	958
486DX2-50C ISA	84	218			788	888
486DX-40C ISA	84	188			758	868
486DX-33C ISA	84	178			748	858
486SX-25C ISA	84	134			704	814
386DX-40/64C	N/A	98			658	768
386SX-40	N/A	58			628	738

PREMIUM MPC

- 8MB Fast RAM
- 256K Fast Secondary Cache
- Medium Tower with Power Supply
- VLB IDE 2FD/2HD Controller
- High Speed UART 25/1P/1G Ports
- 1.44MB 3.5" FDD
- 3 year Limited Parts Warranty*
- 340MB IDE HDD
- Enhanced 101-Key Keyboard
- ATI Ultra Pro 2MB VRAM PCI or VLB
- 14" Non-Interlaced .28 SVGA Monitor
- Microsoft Serial Mouse
- Triple Spin NEC CD-ROM
- Orchid Sound Wave
- Deluxe Speakers
- CD Deluxe Pak (4 Titles)
- MS DOS 6.2x

486DX2-66 VLB	\$1,938
P5-60 PCI-VLB	\$2,348
P5-66 PCI-VLB	\$2,448
P54C-90 PCI-VLB	\$2,648

UPGRADES

- PCI Wide Fast SCSI-3 Controller and 2.0GB HDD Add \$1,445

PCI/VLB CAD/PUBLISHING

- 16MB Fast RAM
- 256K Fast Secondary Cache
- Medium Tower with Power Supply
- VLB IDE 2FD/2HD Controller
- High Speed UART 25/1P/1G Ports
- 1.44MB 3.5" FDD
- 3 year Limited Parts Warranty*
- 540MB IDE HDD
- Enhanced 101-Key Keyboard
- ATI Ultra Pro 2MB VRAM PCI or VLB
- 17" Non-Interlaced .28 SVGA Monitor
- Microsoft Serial Mouse
- MS DOS 6.2x

486DX2-66 VLB	\$2,218
P5-60 PCI-VLB	\$2,618
P5-66 PCI-VLB	\$2,718
P54C-90 PCI-VLB	\$2,918

FAMILY MPC

- 4MB Fast RAM
- 256K Fast Secondary Cache
- Medium Tower with Power Supply
- VLB IDE 2FD/2HD Controller with 25/1P/1G
- 1.44MB 3.5" FDD
- 3 year Limited Parts Warranty*
- 250MB IDE HDD
- Enhanced 101-Key Keyboard
- VLB SVGA Card w/1MB
- 14" Non-Interlaced .28 SVGA Monitor
- Microsoft Serial Mouse
- Double Spin CD-ROM
- Sound Master Pro 16 MCG
- Deluxe Speakers
- CD Deluxe Pak (4 Titles)
- MS DOS 6.2x

486DL-40 VLB	\$1,218
486DX-33 VLB	\$1,278
486DX-40 VLB	\$1,298
486DX2-50 VLB	\$1,318
486DX2-66 VLB	\$1,378
P5-60 VLB	\$1,678
P5-66 VLB	\$1,818
P54C-90 VLB	\$2,048

PCI/VLB WINSTATION

- 4MB Fast RAM
- 256K Fast Secondary Cache
- Medium Tower with Power Supply
- VLB IDE 2FD/2HD Controller with 25/1P/1G
- 1.44MB 3.5" FDD
- 3 year Limited Parts Warranty*
- 210MB IDE HDD
- Enhanced 101-Key Keyboard
- ATI Ultra Pro 2MB VRAM PCI or VLB
- 14" Non-Interlaced .28 SVGA Monitor
- Microsoft Serial Mouse
- MS DOS 6.2x
- MS Windows 3.11

486DX2-66 VLB	\$1,318
P5-60 PCI-VLB	\$1,718
P5-66 PCI-VLB	\$1,818
P54C-90 PCI-VLB	\$2,018

CD ROM / MULTIMEDIA

Creative Sound Blaster Value Edition	\$56
Creative Sound Blaster Pro Value Edition	78
Sound Blaster Pro 16 Basic / MCD	96 / 106
Mediasion Pro Audio Spectrum 16	78
Panasonic or Mitsumi CD-ROM (w/card)	70
Mitsumi Dual Speed CD-ROM (w/card)	128
NEC 3X (510) Triple Speed SCSI (OEM)	316
Panasonic CR-562 Dbl. Speed (w/card)	136
Sony Dual Speed CD-ROM (w/card)	128
Chicony CDS535 (SCSI) Internal	288
Toshiba XM-3401B 200ms (SCSI)	248
Creative Discovery CD16 Upgrade Kit	296

NEW HARD DRIVES

212mb 16ms (IDE)	\$160
250mb 14ms (IDE)	180
340mb 15ms (IDE)	198
420mb 12ms (IDE)	214
540mb 12ms (IDE)	278
1.0GB 10.5ms (IDE)	528
340mb 13ms (SCSI)	248
540mb 12ms (SCSI)	338
1.0GB / 2.0GB 13ms (SCSI)	618 / 1,048

HARD/FLOPPY DRIVE ADAPTERS

IDE I/O (ISA / VLB)	11 / 17
Enhanced I/O (2S, 1P) w/16550 UART	26
ISA IDE I/O (2S, 1P) w/16550 UART	34
VLB IDE I/O (2S, 1P) w/16550 UART	42
Adaptec SCSI 1542CF / 1542CFK	164 / 234
Adaptec SCSI 2842 (EISA VLB)	228
Bustek SCSI 445S (VLB) / 742K (EISA)	218
Promise DC-200 / 4030 (OK Cache)	88 / 98

PRINTERS

Citizen GSX-190 (9-Pin)	\$158
Citizen GSX-220 / 230 (24-Pin)	168 / 240
Citizen GSX-240 / 145 (24-Pin)	290 / 368
Color Option for Citizen Printer	46 / 66
Panasonic KX-P1150 / 2023	138 / 190
Panasonic KX-P2124 / 3624	316 / 396
Color Upgrade Kit KX-PCK11	54

MISCELLANEOUS

Fax Modem (9600 Fax, 2400 Modem)	36
Fax Modem (14,400 Fax, 14,400 Modem)	58
Fax Modem 28.8 (28.8 Data, 14.4 Fax) Int.	148
US Robotics 14,400 Fm Int / Ext	108 / 128
Logitech Mouseman Serial / Bus	46 / 62
Microsoft Mouse Serial / Bus	22 / 56
Comnet Tape Backup 250MB	138
Colorado Tape Backup DJ-10/20	96 / 156
Colorado Tracker JT-20 (250MB) Ext.	304
16 Bit Ethernet Card Coax/10 Base T	30 / 32
16 Bit Ethernet Card Combo	84

VIDEO CARDS AND MONITORS

VGA-256K / 512K / 1MB	\$28 / 36 / 56
Windows Accelerators w/1MB	56
Trident / Cirrus Logic w/1MB (VLB)	66 / 66
Genoa 8500 VLB w/1MB	88
ATI Wonder PCI / VLB / ISA 1MB (DRAM)	118
ATI Plus PCI / VLB / ISA 2MB (DRAM)	166
ATI Ultra Pro PCI / VLB 2MB VRAM	226
ATI Ultra Pro 2MB VRAM (EISA)	286
Diamond Speed Star Pro VLB / ISA	94
Diamond Stealth 24VLI w/1MB	124
Diamond Viper SE 2MB (VLB / PCI)	286 / 258
Orchid Celsius VLB 1MB / 2MB	124 / 184
Orchid Fahrenheit ISA / VLB w/1MB	122 / 132
Orchid Kelvin EZ VLB 1MB (DRAM)	104
Orchid Kelvin VLB (64-Bit) 1MB/2MB	136 / 184
Orchid Kelvin PCI (64-Bit) 1MB/2MB	136 / 184
CTX 14" NI / 15" LR / 17" LR	246 / 326 / 612
MAG 15F (15") / 17F (17")	366 / 666
Nanao F5501 / F5501w	858 / 948
Nanao T5601 / F5601w	1,438 / 1,188
NEC 3V / 4F6e / 5F6e	464 / 648 / 978
Sony 17SE1 / 1730 / 20SE1	936 / 926 / 1,836
Viewsonic 4E / 6E / 14E	282 / 278 / 306
Viewsonic 15E / 15EX / 15	368 / 378 / 426
Viewsonic 17G / 17 / 20	784 / 688 / 1,494
14" Mono / VGA Mono	74 / 94
14" Super VGA (1024x768, 0.39)	180
14" Super VGA Int / Non-Int	204 / 212
15" Super VGA (1280x1024, 0.26)	292
17" Super VGA (1280x1024, 0.26)	568

MULTIMEDIA VLB NOTEBOOK

- 32-Bit VLB Bus Windows Accelerator
- One Type III or Two Type II PCMCIA Slots
- Built-In Sound Card & Speaker
- 1MB Video Memory
- 4MB Fast RAM
- 120MB HDD
- Built-In Trackball
- NiCD Battery
- Carrying Case

Super Sales	VGA Mono	Dual Scan Color	Active Matrix Color
486SX 25	\$1,378	\$1,888	\$2,088
486SX 33	\$1,398	\$1,808	\$2,008
486SX 33	\$1,528	\$2,038	\$2,038
486DX2 50	\$1,548	\$2,058	\$2,058
486DX2 60	\$1,568	\$2,078	\$2,078

UPGRADES

- MS DOS 6.22 Add \$40
- RAM 8MB / 16MB Add \$240 / 700
- HDD 250MB / 340MB Add \$110 / 180
- PCMCIA Fax Modem (96/48/24) Add \$120

Dee One Systems
To Order Call
800-831-8808



No surcharge on credit card orders

THE POWER TO GO

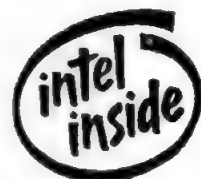
...with the solutions to meet your needs.

SoundPro



Our Award winning TravelPro 5300 series has just gotten better. With added sound module and local bus I/O, the SoundPro is the clear winner.

- Choice of Upgradable Intel CPU's 486SX-25, DX-33, DX2-50, DX2-66, DX4-75 & DX4-100
- Available in upgradable Active Matrix, Dual Scan Passive or Monochrome Displays
- 4MB RAM - Upgradable to 32MB
- Local Bus Video & Local Bus HD I/O
- Center Trackball, PCMCIA Type III, 1.44MB Floppy and built in 16 bit sound module.
- Over 3 hours of Battery Life
- 5.9lbs Monochrome - 6.3 lbs. Color
- 200MB Hard Drive (200 - 520MB Available)
- Includes AC Adapter, NIMH Battery, Carrying Case, External Speakers, MS Dos 6.22, Windows for Workgroups 3.11 & MS Sound System Software
- Optional Internal 14.4/14.4 Fax/Modem
- Optional Docking Station



DX4-75 Dual Scan Color \$2295
200MB HDD. 4MB RAM all & Accessories



TravelPro 350

So many features... So little money



- Large Center Based 25mm Trackball With Palmrest
- Intel Low Voltage SX-33 CPU
- 9.5" Monochrome Display
- 4MB RAM Upgradable to 20MB
- Removable Hard Drive (200 - 540mb available)
- Unique Removable Keyboard for easy access to upgrades & International Keyboard Support
- Includes AC Adapter, NIMH Battery, Carrying Case, Internal 9600/2400 Fax/Modem with Comm. Software, MS DOS 6.22, Windows for workgroups 3.11

SX-33 Monochrome \$1295
200MB HDD. 4MB RAM all & Accessories

CIRCLE 235 ON READER SERVICE CARD

Corporate, Dealer & Government Pricing Available



Intel Inside is a registered Trademark of Intel Corp. MS Dos & MS Windows are registered trademarks of Microsoft Corp. Not responsible for errors in advertising. Call for details on 30 day money back guarantee. restrictions apply.

1-800-868-8108



Hours of Operation: M-F 9:00 a.m. - 6:00 p.m. • Saturday 9:00 a.m. - 3:00 p.m. PST

AMS

The Power To Go

12881 Ramona Blvd. Irwindale, CA. 91706
Tel: (818) 814-8881 • Fax: (818) 814-8782

PCsources says...
Kenosha Computer
Center offers some of the Best
Buys in Mail Order!

EXPERIENCE THE KENOSHA DIFFERENCE

- Over Seven Years of Service
- Thousands of Satisfied Customers
- Terrific Technical Support
- Everyday Low Prices
- No Surcharge on Credit Cards

KENOSHA COMPUTER CENTER:
YOUR DIRECT SOURCE for
SERVICE and VALUE.
CALL US TODAY!

EPSON®

FX 870.....	\$259	FX 1170.....	\$345
LQ 570+.....	\$235	LQ 870.....	\$425
LQ 1070.....	\$355	LQ 1170.....	\$589
DFX 5000.....	\$1299	DFX 8000.....	\$2189
STYLUS 800 INKJET.....	\$239		
STYLUS 400/1000 INKJET.....	\$239/\$429		
ACTION LASER 1000/1100.....	\$579/\$479		
ACTION LASER 1500/1600.....	\$639/\$929		
SCANNER 600/800.....	\$749/\$879		
SCANNER 1200 PRO.....	\$1189		

STYLUS COLOR Inkjet Printer

Highest inkjet resolution available. 720 dpi produces images difficult to distinguish from photos. \$545

KENOSHA COMPUTER CENTER

SALES LINE OUTSIDE WISCONSIN

1-800-255-2989

Shipping/customer service/technical assistance, call
414-697-9595 • FAX 414-697-0620



HEWLETT PACKARD

NEW: LASERJET IV PLUS.....	\$1429
LASERJET IV/IVM PLUS.....	\$1299/\$1949
LASERJET IV/IVMP.....	\$959/\$1369
LASERJET IVL/IVML.....	\$669/\$1039
LASERJET IVSI/IVSIMX.....	\$2989/\$4389
2MG/4MG/8MG UPGRADE.....	CALL
HP IIP/IIICX SCANNER.....	\$489/\$949
DESKJET 520/560C.....	\$289/\$569
DESKJET 550C.....	\$429
DESKJET 1200C or 1200C/PS.....	CALL

**720 DPI
COLOR**

OKIDATA

ML320/ML321.....	\$295/\$415
ML520/ML521.....	\$365/\$489
ML590/ML591.....	\$409/\$559
ML395/ML395 COLOR.....	\$949/\$1029
PM3410.....	\$1199
OL400E/OL410E 600DPI.....	\$495/\$645
OL410E POSTSCRIPT.....	CALL
OL810/OL830.....	\$999/\$1089
OL850+.....	\$1189
DOC IT 3000/4000.....	\$1769/\$2129

Panasonic

Office Automation

4400/4410 Lasers.....	\$499/\$449
4430/4440 Lasers.....	\$639/\$989
4455/5400 Lasers.....	\$1499/\$779

intel OVERDRIVE

PROCESSOR UPGRADES

- For any Intel 486 based system
- Improves system performance up to 70%
- Accelerates all DOS, Windows, OS/2 and Unix applications
- Cost effective upgrade to next generation CPU technology

Overdrive SX2-50 Double 20-25 Mhz.....	\$179
Overdrive DX2-50 Double 20-25 Mhz.....	\$225
Overdrive DX2-66 Double 33 Mhz.....	\$289

CYRIX DOUBLERS

CX486SRX2-20/40 OR SRX2-16/32.....	\$219
CX486DRX2-20/40.....	\$219
CX486DRX2-25/50.....	\$259
CX486DRX2-33/66.....	\$299

MEMORY PRODUCTS

IBM PS1 486 4MB/8MB.....	\$179/\$349
COMPAQ PROLINEA 4MB/8MB.....	\$169/\$329
4MB IBM THINKPAD 700, 700C.....	\$209
4MB TOSHIBA 2000, 2200, 1850C.....	\$209
4MB TEXAS INST. TRAVELMATE.....	\$199
1 & 4 MB SIMMS.....	CALL
2 MB FOR OKI 400.....	\$125
2 MB FOR EPSON ALI.....	\$139
2 MB FOR H-P IIP, IIIP & III.....	\$109
HP LASERJET MEMORY.....	CALL
CALL FOR ALL OTHER MODELS & MFG.	

DIGITIZERS & CD-ROM

SUMMASKETCH 12x12.....	\$269
SUMMASKETCH 12x18.....	\$499
SUMMASKETCH 24x36.....	\$1219
NEC 3XP/4X PRO.....	\$379/\$869
NEC 3XI/3XE TRIPLE SPIN.....	\$399/\$429

BATTERY BACKUPS AMERICAN

250/400.....	\$99/\$155
450/600.....	\$189/\$259
900/1250.....	\$369/\$485
SMART UPS 400/600.....	\$289/\$339
SMART UPS 900/1250.....	\$479/\$619
TRIPLITE all models.....	CALL

"BUBBLEJET" PRINTERS

BJ 10SX.....	\$209*
BJ 200E.....	\$249*
BJ 230.....	\$359*
BJC 600.....	\$529*

(COLOR)

LASER PRINTERS

LBP 430.....	\$549*
LBP 860.....	\$1069*

600 DPI, 8PPM

* after rebate

Canon

NOTEJET COMPUTERS

NOTEJET 486 SX33 120 MG.....	\$1849
NOTEJET 486 SX33 200 MG.....	\$1929
NOTEJET 486 SX 33Mhz 120 MG Color.....	\$2429
NOTEJET 486 SX 33Mhz 200 MG Color.....	\$2499
NOTEJET II SLC2-50 130 MG.....	\$2759

Notejets have Built-in Bubblejet printer,
4mg RAM, 2 PCMCIA slots, DOS, Windows.

INNOVA NOTEBOOKS

486SL-25 120MG.....	\$1199
DUAL SCAN COLOR.....	\$1799

All Innovas have 4mg RAM, FAX Modem,
DOS, Windows and built-in trackball.

HARD DRIVES

SEAGATE 260 MB 3290A.....	\$225
SEAGATE 420 MB ST1480A.....	\$259
SEAGATE 452 MB 3550A.....	\$269
SEAGATE 545 MB ST3655A.....	\$329
SEAGATE ST12400N 9ms, 2.14 GB BUNDLED W/ADAPTECH 1542C, FAST SCSI 2.....	\$1649
CONNER CFA 420MB IDE.....	\$259
CONNER CFA 540MB IDE.....	\$329
CONNER CFA 1.08GB IDE.....	\$699
CONNER 340MB SCSI.....	\$289
CONNER 106GB 1.06GB SCSI.....	\$749
CONNER CFP10405 9ms, 1.06GB BUNDLED W/ADAPTECH 1542C, FAST SCSI 2.....	\$899

TAPE BACK UP

COLORADO TRAKKER 250.....	\$299
COLORADO JUMBO 250.....	\$155
COLORADO JUMBO 120.....	\$99
COLORADO 2 GB EXT.....	\$1069
COLORADO 4 GB EXT.....	\$1399
CONNER 250 MB INTERNAL.....	\$149
CONNER 250 MB EXTERNAL.....	\$289
QIC 80 TAPES.....	\$17

SOFTWARE

ALDS PAGEMAKER.....	\$499
COREL DRAW ON CD.....	\$279
LOTUS 123 VER 2 4/3.4.....	\$279/\$325
MICROSOFT EXCEL/WINDOWS.....	\$289
MICROSOFT OFFICE.....	\$449
MICROSOFT WORD/WINDOWS.....	\$299
NORTON UTILITIES 7.0.....	\$99
PC ANYWHERE HOST REMOTE.....	\$99
WORD PERFECT 6.0.....	\$249
WORD PERFECT WINDOWS 6.0.....	\$269
ALL OTHER TITLES.....	CALL

NOTEBOOKS

TEXAS INSTRUMENTS

486 4000E SX-25 120MB Color.....	\$1849
486 DX2-40 200 MB Color.....	\$2889
486 DX2-50 200 MB Mono.....	\$2279
486 DX2-50 200MB ACTIVE Color.....	\$2829
486 4000E DX4-75 Mhz.....	\$3549

PC 8650 WITH 200 MB, 2 PCMCIA
SLOTS, 4MB RAM, 8.4" COLOR
ACTIVE MATRIX SCREEN.....\$2589

MONITORS

MAG DX15F/MX15F.....	\$349/\$459
MAG DX17F/MX17F.....	\$659/\$779
MAG MX21F.....	\$1759
Mitsubishi Diamond Scan 15FS.....	\$409
Mitsubishi Diamond Pro 17".....	\$919
Mitsubishi Diamond Pro 21T.....	\$1949
NEC 3FGE/3V.....	\$549/\$459
NEC 4FGE.....	\$589
NEC 5FGE/5FGP.....	\$969/\$1079
NEC 6FGP.....	\$1948
Nanao 340 IW/F550 I.....	\$649/\$899
Nanao T560 I/F550 IW.....	\$1459/\$979
Nanao F560 IW/T760IW.....	\$1229/\$1969
Viewsonic 15.....	\$429
Viewsonic 17/17G.....	\$879/\$769
Viewsonic 20.....	\$1499
Viewsonic 21.....	\$1679
CTX 5468A/1451.....	\$249/\$249
CTX 1561/1760.....	\$319/\$629

GRAPHICS CARDS

ATI GRAPHICS ULTRA+ 2MB.....	\$189
ATI GRAPHICS PRO 2MB.....	\$259
ATI GRAPHICS PRO TURBO.....	\$349
DIAMOND STEALTH PRO 1 MB.....	\$219
DIAMOND VIPER 2MB.....	\$319
HERCULES GRAPHITE 2MB.....	\$339

No charge for MasterCard or Visa. We ship COD on a cash or
cashier's check basis only. Shipping & handling 3% (\$6 minimum,
\$10 minimum on printers). AK and HI slightly higher. Returned
items may be subject to restocking fee. Purchase orders
accepted from Fortune 1000, Government institutions,
schools and universities.
Prices and availability
subject to change.

FAX MODEMS

PRACTICAL PERIPHERALS

PRACTICAL 14.4/28.8 POCKET.....	\$259/\$369
PRACTICAL 14.4 INT/EXT.....	\$105/\$119
PRO CLASS 14.4 INT/EXT.....	\$149/\$159
PRACTICAL 28.8 INT/EXT.....	\$219/\$229
PRACTICAL PCMCIA 14.4.....	\$265

HAYES

OPTIMA 14.4 EXT.....	\$349
OPTIMA 28.8 INT/EXT.....	\$349/\$399
ACCURA 14.4 / 28.8.....	\$119/\$255
POCKET 14.4.....	\$289
PCMCIA 14.4.....	\$259

U.S. ROBOTICS

SPORTSTER 14.4 INT/EXT.....	\$109/\$129
SPORTSTER 14.4 W/FAX INT/EXT.....	\$115/\$135
SPORTSTER 28.8 W/FAX INT/EXT.....	\$199/\$219
V.32 TERBO W/FAX.....	\$345
WORLD PORT 14.4 PCMCIA.....	\$195

DVC

14.4 INT/EXT FAX MODEM.....	\$95/\$109
28.8 INT/EXT FAX MODEM.....	\$189/\$199

intel

SATISFACTION 200 24/96 INT.....	\$199
SATISFACTION 400 INT 14.4/14.4.....	\$259
SATISFACTION 400 EXT 14.4/9600.....	\$289
FAX MODEM 14.4/14.4 INT.....	\$115
FAX MODEM 14.4/14.4 EXT.....	\$135
PCMCIA 24/96.....	\$129
PCMCIA 14.4/14.4 FAX MODEM.....	\$189

NETWORKING

NETWORK 3.12 5 USER.....	\$569
NETWORK 3.12 10 USER.....	\$1289
NETWORK 3.12 25 USER.....	\$1849
NETWORK 3.12 50 USER.....	\$2349
NETWORK 4.0.....	CALL
NE 2000 or 5 PACK.....	\$69/\$329
LANTASTIC 6.0 STARTER KIT.....	\$409
LANTASTIC 6.0 NETWORK ADD ON.....	\$149
NODERUNNER SI 2000T 10 PAK.....	\$689
LANTASTIC CENTRAL STATION.....	\$325
BOCA PCMCIA 10BT.....	\$145
BOCA HUB 16 PORT TP.....	\$239
BOCA 10BT ETHER 10 PAK.....	\$489
3COM 3C509.....	\$115
3COM 3C509 5 PAK.....	\$469
3COM 3C569 COMBO PCMCIA.....	\$229
3COM 3C529 16/32 MCA.....	\$225
3COM 3C579TP EISA TP.....	\$225
LINK BUILDER FMSII 24 PORT.....	\$989
INTEL ETHER 16.....	\$89
INTEL ETHER 16 5 PAK.....	\$419
INTEL ETHER 16 20 PAK.....	\$1579
INTEL ETHER FLASH 5 PAK.....	\$479
INTEL ETHER FLASH 20 PAK.....	\$1799
INTEL ETHER COMBO/5 PAK.....	\$115/\$509
INTEL ETHER COMBO 20 PAK.....	\$1899
SMC 3512TP CONC 12 PORT.....	\$579
SMC 3608TP CONC 8 PORT.....	\$289
XIRCOM POCKET ADAPTER.....	\$249
XIRCOM PCMCIA ETHER ADAPTER.....	\$229
XIRCOM POCKET ETHER PRINT SVR.....	\$269

KENOSHA COMPUTER CENTER

2133 91st Street
Kenosha, Wisconsin 53143

KENOSHA COMPUTER CENTER

1-800-255-2989

CIRCLE 242 ON READER SERVICE CARD

Mon.-Fri. 8am-7pm • Sat. 9am-3pm

COMPUTERS

Packard Bell

486SX/25 4/210MB Multimedia	\$999
486SX/25 4/340MB Multimedia	1275
486DX/50 4/810MB Multimedia MT	1575
486DX/66 4/420MB Multimedia	1475
486DX/66 8/540MB Multimedia	1675
486DX/66 8/810MB Multimedia TBU	1975
Pentium/60 8/420MB Multimedia	2075
Pentium/90 8/540MB Multimedia	2475
Pentium/90 8/810MB Multimedia MT	2650

AST

Bravo 486DX/2-66 270MB	\$1799
Bravo 486DX/2-66 340MB CD	2299
Bravo 486DX/4-100 270MB	2284
Bravo 486DX/4-100 540MB	2549
Bravo 486SX/33 170MB	1158
Bravo 486SX/50 170MB	1299
Bravo MT/60 Pentium 540MB CD	2999
Bravo MT/60 Pentium 270MB	2299
Premia 486DX/33 340MB	2199

Call ValueLine for all AST notebooks

Canon

NoteJet 4/33 120HD	
with built-in printer	\$1899
NoteJet 4/33 200HD	
with built-in printer	1999
NoteJet 486SX/25 260HD	
with built-in printer	2995

TEXAS
INSTRUMENTS

TM4000E DX/2 200HD Mono	\$2525
TM4000 DX/25 120HD Mono	1748
TM4000E DX/25 200HD Color	3250
TM4000E SX/25 120HD Color	2299
TM4000E DX/75 340HD Color	4399



PS/I 486SX/33 253HD	\$1199
PS/I 486DX/50 420HD-CD	1549
PS/I 486DX/50 340 Mini	1149
ValuePoint 486 DX/33 4-120	1249
ValuePoint 486 DX/33 4-212	1299
ValuePoint 486 DX/66 120MB	1675
ValuePoint 486 DX/66 212MB	1725
ThinkPad 350 Color 125MB	1349
ThinkPad 350 Color 250MB	1899
ThinkPad 360 Mono 170MB	1899
ThinkPad 360Cs Color 170MB	2499

Call for additional Models

MEMORY UPGRADES

VALUELINE STOCKS VIKING & KINGSTON
MEMORY FOR MOST COMPUTERS
PRICES CHANGE, SO CALL US FOR
YOUR BEST PRICE!

PRINTERS

OKIDATA

ML184 Turbo	\$219	ML321	\$419
ML380	210	ML521	485
ML320E	295	OL400E	495
ML520	363	ML591	569
ML590	419	OL410E	649
		OKI395LE	999

Panasonic

2023	\$179	4410 Laser	\$499
4400 LED	499	2624	399
2130	109	3123	249
1654	599	3124	329
2124	315	3624	409
1150	139		

Canon

BJ230	\$399	430 Laser	\$575
BJ200E	285	BJ105X	249
BJC600	565		



4037 SE LED Printer	\$649
4039 Laser Model 16L Plus	2699
4039 Laser Model 12R Plus	1499
4039 PostScript 10RD	1799
4039 PostScript 10R	1299
4076 ExecJet II Ink Printer	275

VGA BOARDS

ATI Graphics Ultra Pro EISA 2MB	\$389
ATI Graphics Ultra + 2MB	235

Mercury D301 Dynamite Pro ISA	\$164
Mercury D302 Dynamite Pro ISA	226

BOCA Super VGA with 512K	\$69
BOCA Super Accelerator with 1MB	119
BOCA Voyager Local Bus	129
BOCA Vortex VRAM with 2MB 16-bit	199

VALUELINE

WHERE MORE THAN JUST THE PRICE IS RIGHT

Your source for Hewlett-Packard, IBM and Macintosh
Certified Repair Services Department Authorized to Work on Every Product We Sell
\$30,000,000 Inventory With Thousands of software titles in stock

CALL TOLL FREE

1-800-700-1000

Monday-Friday 8:30am to 6:00pm

IN ILLINOIS 24 HOUR FAX LINE
(708) 933-1100 1-800-677-7168

BIG SAVINGS • SUPER SELECTION • GREAT SERVICE



TOSHIBA

11910/200	\$1499
11910C/200	2025
11960CS/200	2499
11960CT/200	2999
11960CT/300	3199
14700CS/200	3199
14700CS/320	3359
14700CT/200	4599
14700CT/320	4899
14800CT/500	5699
16600CD	6695

HEWLETT
PACKARDHP LaserJet
4L Printer
\$629

LaserJet 4P	\$949
LaserJet 4ML for MACs	949
LaserJet 4MP for MACs	1349

PRINTERS

HEWLETT
PACKARD

DeskJet 520	\$289
DeskJet 500C Color	349
DeskJet 560C Color	559
DeskWriter 520	289
DeskWriter C Color Printer for MACs	349
DeskWriter 550C Color Pro for MACs	399
DeskWriter 560C Color Pro for MACs	599
DeskJet 310 Portable for IBMs	299
DeskWriter 310 Portable for MACs	299

EPSON

UX300	\$169	AP2250	\$125
FX870	269	AP3250	159
FX1170	355	AP3260	179
LQ1070+	369	DFX5000+	1313
LQ570+	239	DFX8000	2209
LQ870	449	Stylus 800	249
LQ2550	889	Stylus 300	195
LQ1170	599	Laser 1500	639

BATTERY BACK-UPS

EPP

BACK UP 250	\$95	SMART 400	\$289
BACK UP 400	154	SMART 600	339
BACK UP 450	185	SMART 900	499
BACK UP 600	259	SMART 900XL	799
BACK UP 900	359	SMART 1250	619
BACK UP 1250	485	SMART 2000	1029

IBM

BC 250	\$92	SMART 250	\$219
BC 400	144	SMART 400	259
BC 500	175	SMART 500	279
BC 500 LAN	179	SMART 600	299
BC 600 LAN	229	SMART 750	399
BC 750 LAN	275	SMART 900	455
BC 900 LAN	319	SMART 1250	565
BC 1250 LAN	439		

HARD DRIVES

Seagate

ST3243A 214MB 3 1/2" IDE	\$189
ST3391A 341MB 3 1/2" IDE	245
ST3491A 428MB 3 1/2" IDE	279
ST3655A 545MB 3 1/2" IDE	369
ST31200N 1 05GB SCSI2	729

Maxtor

7171A 172MB IDE 3 1/2"	\$199
7273A 273MB IDE 3 1/2"	269
7345A 340MB IDE 3 1/2"	289
7546A 540MB IDE 3 1/2"	379

HARD DRIVES

CONNER

Conner 210MB 3 1/2" IDE	\$189
Conner 420MB 3 1/2" IDE	269
Conner 540MB 3 1/2" IDE	359
Conner 810MB 3 1/2" IDE	539
Conner 1 08GB 3 1/2" IDE	619

BOCA IDE & I/O Controller	\$49
IDE Controller	29
IDE Controller with I/O	39

MULTIMEDIA

M

Pro-Audio 16 Basic	\$79
Family Deluxe Multimedia Kit	325
Super Deluxe Multimedia Kit	392

CREATIVE

Sound Blaster Value	\$59
Sound Blaster Pro Value	79
Sound Blaster 16 Basic Value	99
Sound Blaster MCD 16	149
Sound Blaster SCSI 16	169
Sound Blaster MCD ASP 16	179
Sound Blaster SCSI ASP 16	199
Game Blaster CD 16 Kit	375

Monterey	\$329
Crescendo Sound System	349
Rio Sound System	129

Labtec

Labtec CS 150 Speakers	\$17
Labtec SS 700 Speakers	36
Labtec CS 550 Speakers	25
Labtec CS 1000 Speakers	79
Labtec CS 1400 Speakers	99
Labtec CS 800 Speakers	39
Labtec CS 900 Speakers	69

ACS 50 Speakers	\$65
ACS 300 Speakers	235

CD-ROM

NEC-CDR 400 3XP Triple Speed	\$419
NEC-CDR 500 3XI Triple Speed	439
NEC-CDR 600 3XE Triple Speed	499
Toshiba XA3401E	375
Toshiba XA3401B	299
Microsolutions DB Speed External CD-ROM Drive	379

CD-ROM

CHINON

CDSS35 Int. DB Speed with SCSI I/F	\$339
CDXS35 Ext. DB Speed with SCSI I/F	429

FAX MACHINES

Canon Fax 16	\$269
Sharp UX-174 with Cutter	289
Sharp UX-254 with Cutter, Digital TAD	379
Canon Fax B140 Plain Paper	799
Canon Fax B160 Plain Paper w/Par. I/F	899
Hewlett-Packard Fax 900 Inkjet	765
Hewlett-Packard Fax 950	965

MODEMS & COMMUNICATIONS

Robotics

14.4 External Sportster	\$125
14.4 External Sportster/Fax	139
14.4 Internal Sportster	115
14.4 Internal Sportster/Fax	119
Worldport 14.4 PCMCIA 2	199

Practical Peripherals

14.4 Internal V.42bis with Fax	\$115
14.4 External V.42bis with Fax	129
28.8 External with Fax	259
28.8 Internal with Fax	239

Hayes

ACCURA 14.4 + Fax 144 Internal	\$145
ACCURA 14.4 + Fax 144 External	155
ACCURA 28.8 External	299

Boca

28,800bps Internal Fax/Modem	\$199
28,800bps External Fax/Modem	229

intel

Faxmodem Series 14.4 External w/Fax	\$115
Faxmodem Series 14.4 External w/Fax	135
14.4/14.4 PCMCIA w/Fax	219

SoftFax/Alton Modems	
100 Internal	\$94
400 Internal	268
400 External	305

Megahertz

24/96 PCMCIA Send/Receive Fax	\$99
24/96 X-Jack PCMCIA Send/Receive V.42	99
9600 PCMCIA Send/Receive V.42	179
14.4 X-Jack PCMCIA V.42	229
14.4 PCMCIA Send/Receive Fax	229
14.4 PCMCIA X-Jack V.42 with Flash ROM	249
14.4 for Compaq Internal V.42 bus	395
96/96 for Compaq Send/Receive V.42	375

VGA MONITORS

NEC

NEC 14" SVGA 28DP	\$349
NEC Multisync 5FG	999
NEC Multisync 4FG	645

SONY

Sony 17SE 17" VGA	\$999
Sony 20" Multisync MDL 2036	1985

LEADING EDGE

Leading Edge 14" EVGA 39DP	\$199
Leading Edge 14" EVGA 28DP NI	249

Packard Bell

Packard Bell 14" SVGA 39DP	\$237
Packard Bell 14" EVGA 28DP NI	322
Packard Bell 15" EVGA 28DP NI	359

Panasonic 14" SVGA 28DP	329
-------------------------	-----

WYSE

WYSE 30 Amber or Green	\$274
WYSE 55 Amber or Green	349
WYSE 60 Amber, Green or White	374
WYSE 150 Amber, Green or White	346
WYSE 160 Amber, Green or White	407
WYSE 185 Amber, Green or White	319
WYSE 325 Color	549
WYSE 370 Color	899

TAPE BACK-UP & MEDIA

OLYMPUS

JUMBO 120	\$95
JUMBO 250	169
TRAXKER 250MB Portable	325
PowerTape 1 0GB Internal	599
PowerTape 2 0GB Internal	899
PowerTape 2 0GB External	1049

MEGA

BERNOULLI PC Powered 90	\$325
BERNOULLI PC Powered 150	469
250MB Tape Back-Up Internal	165

SyDos

SyDos 270MB Int. Cartridge Drive	\$469
SyDos Markin 105MB Int. IDE	289
SyDos 88MB Ext. SCSI	439
SyDos 88MB Int. SCSI	389

3M

3 1/2" Diskettes DSHD Fmt	\$7
5 1/4" Diskettes DSHD Fmt	5
DC 2120	13
DC 2120 XIMAT	15
DC 600A	14
DC 6150	13
DC 6250	17
MAGNUS 1.0	32
MAGNUS 1.2	35

NETWORKING

NOVELL

NetWare Version 3.12	
5 User 3 1/2" .5609	50 User 3 1/2" \$2749
10 User 3 1/2" .1389	100 User 3 1/2" \$2799
25 User 3 1/2" .1999	
SPECIAL PRICING ON UPGRADES	CALL
NetWare Version 4.01 on CD-ROM	
5 User .7799	50 User \$3499
10 User .1779	100 User 4899
25 User .2519	250 User 8729

National

National Ethernet Coax 5-pack	\$379
National Ethernet Coax 20-pack	1499
National Ethernet RJ45 5-pack	339
National Ethernet RJ45 20-pack	1369
National PCMCIA Coax Adapter	165
National PCMCIA RJ45 Adapter	165

intel

Intel EtherExpress 16	\$95
Intel EtherExpress 16C	119
Intel EtherExpress Flash	109
Intel EtherExpress MCA Coax M/C	165
Intel EtherExpress 32-bit EISA	395
Intel EtherExpress ISA Hub	495

Get answers every day a spreadsheet can't give you any day

Real Stats. Real Easy.

**New faster version
& Developer's Kit!
Call today!**

Use SPSS 6.1 for Windows when you need in-depth answers quickly and easily. Go beyond summary statistics and spreadsheet row-and-column math by using the right tool for the job. SPSS is a complete tool kit of statistics, graphs and reports that enables you to answer tough questions like:

- Why did sales drop in the last quarter?
- How satisfied are my customers?
- What are the patterns in my data?

SPSS products are used today for:

Survey research of all types

- Explore consumer awareness
- Compare perceptions of products
- Discover preferences by group

Marketing and sales analysis

- Analyze your customer database
- Forecast sales by product and region
- Improve mailing responses
- Learn which promotions work best

Quality improvement

- Assess process capability
- Reduce nonconformance
- Spot unnatural patterns of variation
- Track incidence of infection

Research of all types

- Test hypotheses
- Determine group differences
- Track performance over time
- Prepare professional reports

Answer your tough questions

You don't need a Ph.D. to learn or use SPSS 6.1 for Windows. A tutorial, task-oriented help and a glossary of statistical terms will help make you an expert. You'll be surprised at how easy it is to do in-depth data analysis.

And, if you are already an expert, you'll appreciate SPSS' rich set of statistical functionality. Whatever your experience level, you'll be able to explore your data thoroughly.

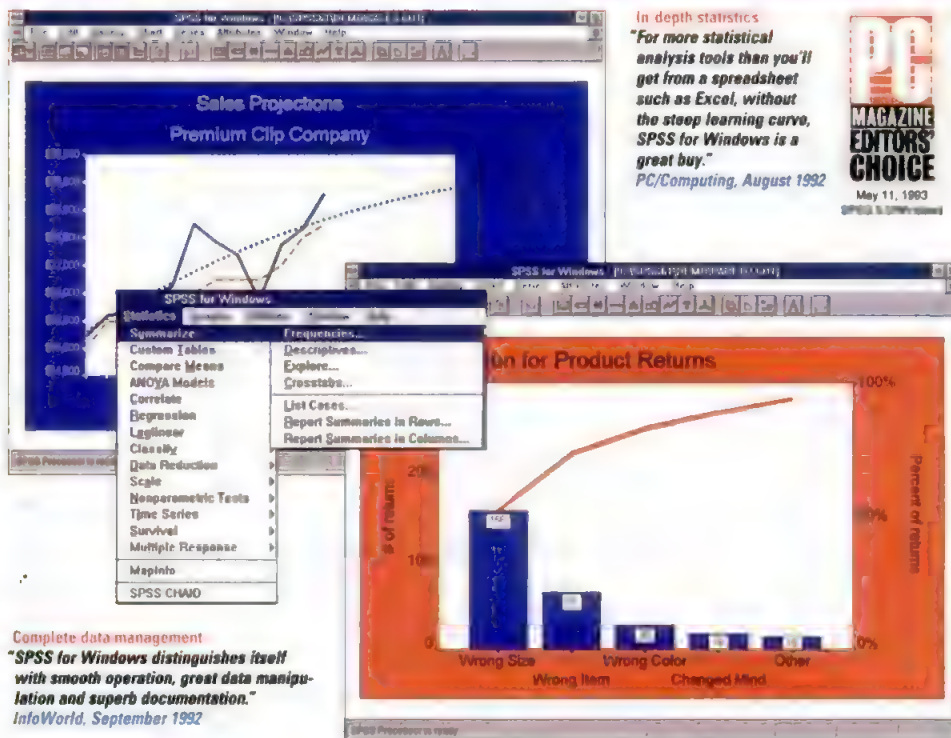
Discover hidden patterns and trends in your data with over 50 high-resolution business, analytical and SQC charts. SPSS saves you time by automatically aggregating your data and labeling your charts. Then, quickly add smoothing lines, confidence intervals and more to tell the full story in your data.

Call today to find out how to answer your tough questions every day with SPSS 6.1 for Windows!

Get a great value - order now!

Call (800) 543-5833

or Fax (800) 841-0064



Complete data management

"SPSS for Windows distinguishes itself with smooth operation, great data manipulation and superb documentation." *InfoWorld, September 1992*

Automatic statistical graphs

"A complete set of graphics and charting capabilities." *PC Week, May 1992*

Learn fast, work fast

"SPSS for Windows is an excellent full-featured set of statistical procedures...The Windows interface makes it easy and fast to use and I highly recommend it." *Marketing Research, Summer 1993*

Reasons SPSS 6.1 for Windows goes beyond your spreadsheet:

- 50+ statistical procedures
- 3D+ business, analytical and SQC charts with automatic labels
- New toolbar which gives you one-button access to statistics and commonly used functions
- Technical support for statistical help
- New online tutorial
- Statistical help system
- Glossary of statistical terms
- Fast 32-bit processing
- Hot buttons between graphs and tables
- Work with even your largest data sets
- Complete report writer

- View your data as words, while doing analysis with numbers
- Keep your formulas safe and separate from your data
- ODBC / OLE
- Statistics located in easy-to-understand menus and dialog boxes
- Easy, complete data editing and management in a spreadsheet-like format
- Documentation which clearly explains statistics
- Create charts with your analysis automatically
- Automatic labeling of results

Available add-on modules:

- Explore your data more thoroughly with techniques such as factor, cluster, discriminant analysis and much more with SPSS Professional Statistics
- Execute advanced multivariate techniques such as Cox regression, Kaplan-Meier estimation, logistic regression and more using SPSS Advanced Statistics
- Create camera-ready tabular reports with SPSS Tables

- Predict the future using advanced time-series analysis in SPSS Transfer
- Perform perceptual mapping, conjoint analysis and optimal scaling procedures with SPSS Categories
- Find predictors and build better models using SPSS CHAO
- Analyze linear structural equations and simultaneous equation models using SPSS LISREL 7

- Improve your operations with statistical process control using QI Analyzer
- Build thematic maps with MapInfo
- Plug components for stats, graphs and reports, complete with data management and output formatting, into your applications quickly and easily using OLE 2.0 Automation in the new SPSS Developer's Kit



Get a great value - order now!

Call (800) 543-5833

or Fax (800) 841-0064

or mail to: SPSS Inc.
444 North Michigan Avenue
Chicago, IL 60611

American Express, Discover, MasterCard
and VISA accepted

Name _____

Title _____

Organization _____

Address _____

City _____

State _____

ZIP _____

email _____

Phone Number () _____

FAX Number () _____

Try SPSS 6.1 for Windows with our unconditional 60-day money-back guarantee

SPSS
Real Stats. Real Easy.

Chicago • Washington, DC • Boulogne • Chertsey • Goringham • Madrid • Munich • New Delhi • Singapore • Stockholm • Sydney • Tokyo • And Distributors Worldwide



Actual home designed using DesignCAD

Jim,
IS THIS THE
CORRECT PRICE
SEEMS TOO
LOW!

DesignCAD 2D
for Windows.
Less Than \$349.

(Lumber Not Included.)



With DesignCAD 2D for Windows, you will have to pay for your own lumber. But take a look at a few of the features you won't have to pay extra for:

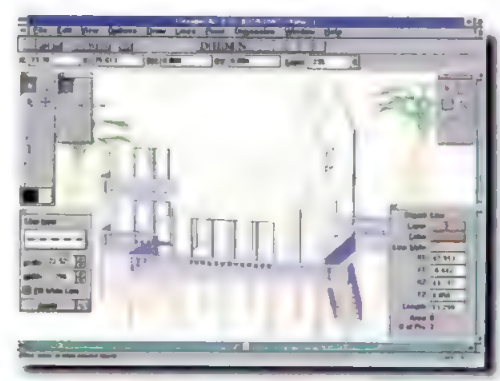
- Easy Edit System
- Powerful Drafting Tools
- Extensive Dimensioning
- 500 FREE Symbols
- Programming Language
- Supports 7 File Formats
- Unlimited Views
- Material List

Call and order your copy of DesignCAD 2D for Windows today! If you need more information, we will send you a FREE color brochure and Demo Disk. To order your copy of DesignCAD 2D for Windows, simply call:

(918)825-7555 or fax (918)825-6359.
CIRCLE 025 ON READER SERVICE CARD

American Small Business Computers
One American Way, Pryor, OK 74361

A \$3500
CAD System
Should Not Only
Design A Home.
It Auto™ Pay
For the Lumber!



If your coupon is missing, call us at (918)825-7555 and we will include our "Builder Pack" containing over 150 predrawn floorplans absolutely FREE when you order DesignCAD 2D for Windows!

ware dest ular s are d of- up ally on

data sets. On these techniques on more humble hardware.

Doing animation on PCs is possible, says Robert Sumble president of RAM Software (Berkeley, CA), but you must compress the data when it's first loaded and use two pages of video RAM. His company's visual software performs real-time, animated visualization on a PC. The software draws each frame to the off-screen page and swaps pages.

The price you pay for the real-time action is the loss of options such as logarithmic axes and hidden-line removal. On the other hand, a program such as Datamatic from Robmax Rescreen (Chamware, IL) creates and stores all the frames in advance. Animations in Datamatic's

The World's Most Powerful Notebook Pentium & 486DX-4

AP 9200

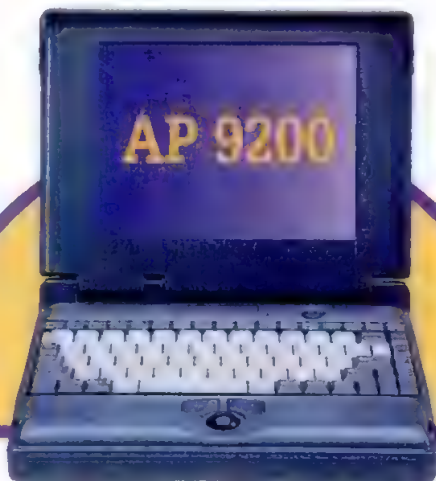
486DX-4

AP 3600

Pentium

- Intel 486 upgradeable CPU
- 2 MB VRAM Local Bus Video with Windows 3.11 Support
- 1 MB on-board RAM
- PCMCIA Type II & Type I Slots
- Built-in Audio Chip
- Microsoft Windows 3.11
- 1000 Secondary Cache Memory Support
- 4 MB RAM expandable to 36MB
- 3.5" 1.44MB Floppy Drive
- 9.5" Mono & Active Matrix LCD, 10.3" Dual Scan LCD
- Simultaneous LCD & CRT Display
- Built-in 25mm Trackball
- NiMH Battery (46 Watts)
- Ports for 1S, 1P, Ext. Keyboard, Ext. VGA Monitor, and 200 Pin Connector for Docking Station
- Microsoft DOS 6.22
- 6.6 lbs. with Battery
- 11" W x 8.66" D x 1.97" H
- Optional V.90 Modem

- Intel Pentium™ 60/66 MHz CPU
- 2 MB VRAM Local Bus Video with Windows 3.11 Support
- 1 MB on-board RAM
- PCMCIA Type II & Type I Slots
- Built-in Audio Chip
- Microsoft Windows 3.11
- 8 MB RAM expandable to 40MB
- Processor up to 80 MB Local Bus (Optional)
- Optional Local Bus 1.2 Controller
- 3.5" 1.44 MB Floppy Drive
- 9.5" Mono & Active Matrix LCD, 10.3" Dual Scan LCD
- Simultaneous LCD & CRT Display
- Built-in 25mm Trackball
- NiMH Battery (46 Watts)
- Ports for Ext. Keyboard, Ext. VGA Monitor, & 200 Pin Connector for Docking Station
- Microsoft DOS 6.22
- 8.15lbs. with Battery
- 11.14" W x 10.31" D x 2.56" H
- Optional V.90 Modem
- Optional PCMCIA Modem



	MONO	COLOR DUAL SCAN	COLOR ACTIVE MATRIX
AP 3600/Pentium-60		\$3195	\$4195
AP 3600/Pentium-66		\$3345	\$4345
AP 9200/486DX-33	\$1595	\$2095	\$2995
AP 9200/486DX-33	\$1775	\$2275	\$3175
AP 9200/486DX2-66	\$1825	\$2325	\$3225
AP 9200/486DX4-100	\$2145	\$2645	\$3545

FOSA
Computer Inc.

1-800-216-3672

TEL: 908-753-6100 FAX: 908-753-6616

400 Corporate Court, #D, South Plainfield, NJ 07080

- Lifetime Toll-Free Technical Support, One Year Parts and Labor Warranty, 30-Day Money Back Guarantee
- Hours: Mon.-Fri., 8:00AM-6PM; Sat., 9AM-3PM



CIRCLE 089 ON READER SERVICE CARD

MEMORY!

H.Co. has America's largest selection of memory products, and we'll **BEAT** any USA advertiser's price!

INCREASE YOUR PRODUCTIVITY IN WINDOWS APPLICATIONS BY ADDING MEMORY AND PROCESSOR UPGRADES FROM H.CO. COMPUTER PRODUCTS, INC.



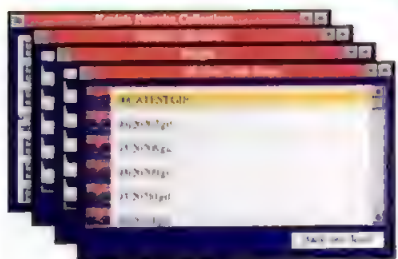
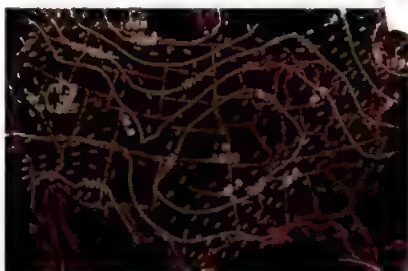
SIMM MODULES

Manufacturer	Model	Capacity	Price
IBM	7144	16MB	\$149.95
IBM	7145	32MB	\$249.95
IBM	7146	64MB	\$449.95
IBM	7147	128MB	\$849.95
IBM	7148	256MB	\$1649.95
IBM	7149	512MB	\$3249.95
IBM	7150	1GB	\$6449.95
IBM	7151	2GB	\$12849.95
IBM	7152	4GB	\$25649.95
IBM	7153	8GB	\$51249.95
IBM	7154	16GB	\$102449.95
IBM	7155	32GB	\$204849.95
IBM	7156	64GB	\$409649.95
IBM	7157	128GB	\$819249.95
IBM	7158	256GB	\$1638449.95
IBM	7159	512GB	\$3276849.95
IBM	7160	1GB	\$6553649.95
IBM	7161	2GB	\$13107249.95
IBM	7162	4GB	\$26214449.95
IBM	7163	8GB	\$52428849.95
IBM	7164	16GB	\$104857649.95
IBM	7165	32GB	\$209715249.95
IBM	7166	64GB	\$419430449.95
IBM	7167	128GB	\$838860849.95
IBM	7168	256GB	\$1677721649.95
IBM	7169	512GB	\$3355443249.95
IBM	7170	1GB	\$6710886449.95
IBM	7171	2GB	\$1342177249.95
IBM	7172	4GB	\$2684354449.95
IBM	7173	8GB	\$536870849.95
IBM	7174	16GB	\$1073741649.95
IBM	7175	32GB	\$2147483249.95
IBM	7176	64GB	\$4294966449.95
IBM	7177	128GB	\$858993249.95
IBM	7178	256GB	\$1717986449.95
IBM	7179	512GB	\$3435972849.95
IBM	7180	1GB	\$6871945649.95
IBM	7181	2GB	\$1374389149.95
IBM	7182	4GB	\$2748778249.95
IBM	7183	8GB	\$5497556449.95
IBM	7184	16GB	\$1099511249.95
IBM	7185	32GB	\$2199022449.95
IBM	7186	64GB	\$4398044849.95
IBM	7187	128GB	\$8796089649.95
IBM	7188	256GB	\$1759217949.95
IBM	7189	512GB	\$3518435849.95
IBM	7190	1GB	\$7036871649.95
IBM	7191	2GB	\$1407374349.95
IBM	7192	4GB	\$2814748649.95
IBM	7193	8GB	\$5629497249.95
IBM	7194	16GB	\$1125899449.95
IBM	7195	32GB	\$2251798849.95
IBM	7196	64GB	\$4503597649.95
IBM	7197	128GB	\$9007195249.95
IBM	7198	256GB	\$1801439049.95
IBM	7199	512GB	\$3602878049.95
IBM	7200	1GB	\$7205756049.95
IBM	7201	2GB	\$1441151249.95
IBM	7202	4GB	\$2882302449.95
IBM	7203	8GB	\$5764604849.95
IBM	7204	16GB	\$11529209649.95
IBM	7205	32GB	\$2305841949.95
IBM	7206	64GB	\$4611683849.95
IBM	7207	128GB	\$9223367649.95
IBM	7208	256GB	\$1844673549.95
IBM	7209	512GB	\$3689347049.95
IBM	7210	1GB	\$7378694049.95
IBM	7211	2GB	\$1475738849.95
IBM	7212	4GB	\$2951477649.95
IBM	7213	8GB	\$5902955249.95
IBM	7214	16GB	\$1180591049.95
IBM	7215	32GB	\$2361182049.95
IBM	7216	64GB	\$4722364049.95
IBM	7217	128GB	\$9444728049.95
IBM	7218	256GB	\$1888945649.95
IBM	7219	512GB	\$3777891249.95
IBM	7220	1GB	\$7555782449.95
IBM	7221	2GB	\$1511156449.95
IBM	7222	4GB	\$3022312849.95
IBM	7223	8GB	\$6044625649.95
IBM	7224	16GB	\$12089251249.95
IBM	7225	32GB	\$2417850249.95
IBM	7226	64GB	\$4835700449.95
IBM	7227	128GB	\$9671400849.95
IBM	7228	256GB	\$19342801649.95
IBM	7229	512GB	\$3868560349.95
IBM	7230	1GB	\$7737120649.95
IBM	7231	2GB	\$1547424149.95
IBM	7232	4GB	\$3094848249.95
IBM	7233	8GB	\$6189696449.95
IBM	7234	16GB	\$1237939249.95
IBM	7235	32GB	\$2475878449.95
IBM	7236	64GB	\$4951756849.95
IBM	7237	128GB	\$9903513649.95
IBM	7238	256GB	\$1980702749.95
IBM	7239	512GB	\$3961405449.95
IBM	7240	1GB	\$7922810849.95
IBM	7241	2GB	\$1584562149.95
IBM	7242	4GB	\$3169124249.95
IBM	7243	8GB	\$6338248449.95
IBM	7244	16GB	\$1267649649.95
IBM	7245	32GB	\$2535299249.95
IBM	7246	64GB	\$5070598449.95
IBM	7247	128GB	\$10141196849.95
IBM	7248	256GB	\$2028239349.95
IBM	7249	512GB	\$4056478649.95
IBM	7250	1GB	\$8112957249.95
IBM	7251	2GB	\$1622591449.95
IBM	7252	4GB	\$3245182849.95
IBM	7253	8GB	\$6490365649.95
IBM	7254	16GB	\$12980731249.95
IBM	7255	32GB	\$2596146249.95
IBM	7256	64GB	\$5192292449.95
IBM	7257	128GB	\$10384584849.95
IBM	7258	256GB	\$2076916949.95
IBM	7259	512GB	\$4153833849.95
IBM	7260	1GB	\$8307667649.95
IBM	7261	2GB	\$1661533549.95
IBM	7262	4GB	\$3323067049.95
IBM	7263	8GB	\$6646134049.95
IBM	7264	16GB	\$1329226849.95
IBM	7265	32GB	\$2658453649.95
IBM	7266	64GB	\$5316907249.95
IBM	7267	128GB	\$10633814449.95
IBM	7268	256GB	\$2126762849.95
IBM	7269	512GB	\$4253525649.95
IBM	7270	1GB	\$8507051249.95
IBM	7271	2GB	\$1701410249.95
IBM	7272	4GB	\$3402820449.95
IBM	7273	8GB	\$6805640849.95
IBM	7274	16GB	\$13611281649.95
IBM	7275	32GB	\$2722256349.95
IBM	7276	64GB	\$5444512649.95
IBM	7277	128GB	\$1088902549.95
IBM	7278	256GB	\$2177805049.95
IBM	7279	512GB	\$4355610049.95
IBM	7280	1GB	\$8711220049.95
IBM	7281	2GB	\$1742244049.95
IBM	7282	4GB	\$3484488049.95
IBM	7283	8GB	\$696897649.95
IBM	7284	16GB	\$1393795249.95
IBM	7285	32GB	\$2787590449.95
IBM	7286	64GB	\$5575180849.95
IBM	7287	128GB	\$11150361649.95
IBM	7288	256GB	\$2230072349.95
IBM	7289	512GB	\$4460144649.95
IBM	7290	1GB	\$8920289249.95
IBM	7291	2GB	\$1784057849.95
IBM	7292	4GB	\$3568115649.95
IBM	7293	8GB	\$7136231249.95
IBM	7294	16GB	\$1427246249.95
IBM	7295	32GB	\$2854492449.95
IBM	7296	64GB	\$5708984849.95
IBM	7297	128GB	\$11417969649.95
IBM	7298	256GB	\$2283593949.95
IBM	7299	512GB	\$4567187849.95
IBM	7300	1GB	\$9134375649.95
IBM	7301	2GB	\$1826875149.95
IBM	7302	4GB	\$3653750249.95
IBM	7303	8GB	\$7307500449.95
IBM	7304	16GB	\$14615000849.95
IBM	7305	32GB	\$29230001649.95
IBM	7306	64GB	\$5846000349.95
IBM	7307	128GB	\$11692000649.95
IBM	7308	256GB	\$23384001249.95
IBM	7309	512GB	\$4676800249.95
IBM	7310	1GB	\$9353600449.95
IBM	7311	2GB	\$18707200849.95
IBM	7312	4GB	\$37414401649.95
IBM	7313	8GB	\$7482880349.95
IBM	7314	16GB	\$14965760649.95
IBM	7315	32GB	\$29931521249.95
IBM	7316	64GB	\$5986304249.95
IBM	7317	128GB	\$1197260849.95
IBM	7318	256GB	\$2394521649.95
IBM	7319	512GB	\$4789043249.95
IBM	7320	1GB	\$9578086449.95
IBM	7321	2GB	\$1915617249.95
IBM	7322	4GB	\$3831234449.95
IBM	7323	8GB	\$7662468849.95
IBM	7324	16GB	\$1532493749.95
IBM	7325	32GB	\$3064987449.95
IBM	7326	64GB	\$6129974849.95
IBM	7327	128GB	\$12259949649.95
IBM	7328	256GB	\$2451989949.95
IBM	7329	512GB	\$4903979849.95
IBM	7330	1GB	\$9807959649.95
IBM	7331	2GB	\$1961591949.95
IBM	7332	4GB	\$3923183849.95
IBM	7333	8GB	\$7846367649.95
IBM	7334	16GB	\$1569273549.95
IBM	7335	32GB	\$3138547049.95
IBM	7336	64GB	\$6277094049.95
IBM	7337	128GB	\$1255418849.95
IBM	7338	256GB	\$2510837649.95
IBM	7339	512GB	\$5021675249.95
IBM	7340	1GB	\$1004335049.95
IBM	7341	2GB	\$2008670049.95
IBM	7342	4GB	\$4017340049.95
IBM	7343	8GB	\$8034680049.95
IBM	7344	16GB	\$1606936049.95
IBM	7345	32GB	\$3213872049.95
IBM	7346	64GB	\$6427744049.95
IBM	7347	128GB	\$1285548849.95
IBM	7348	256GB	\$2571097649.95
IBM	7349	512GB	\$5142195249.95
IBM	7350	1GB	\$1028439049.95
IBM	7351	2GB	\$2056878049.95
IBM	7352	4GB	\$4113756049.95
IBM	7353	8GB	\$822751249.95
IBM	7354	16GB	\$1645502449.95
IBM	7355	32GB	\$3291004849.95
IBM	7356	64GB	\$6582009649.95
IBM	7357	128GB	\$13164019249.95
IBM	7358	256GB	\$2632803849.95
IBM	7359	512GB	\$5265607649.95
IBM	7360	1GB	\$1053121549.95
IBM	7361	2GB	\$2106243049.95
IBM	7362	4GB	\$4212486049.95
IBM	7363	8GB	\$842497249.95
IBM	7364	16GB	\$1684994449.95
IBM	7365	32GB	\$3369988849.95
IBM	7366	64GB	\$6739977649.95
IBM	7367	128GB	\$13479955249.95
IBM	7368	256GB	\$2695991049.95
IBM	7369	512GB	\$5391982049.95
IBM	7370	1GB	\$1078396449.95
IBM	7371	2GB	\$2156792849.95
IBM	7372	4GB	\$4313585649.95
IBM	7373	8GB	\$8627171249.95
IBM	7374	16GB	\$1725434249.95
IBM	7375	32GB	\$3450868449.95
IBM	7376	64GB	\$6901736849.95
IBM	7377	128GB	\$13803473649.95
IBM	7378	256GB	\$2760694749.95
IBM	7379	512GB	\$5521389449.95
IBM	7380	1GB	\$1104277849.95
IBM	7381	2GB	\$2208555649.95
IBM	7382	4GB	\$4417111249.95
IBM	7383	8GB	\$8834222449.95
IBM	7384	16GB	\$1766844449.95
IBM	7385	32GB	\$3533688849.95
IBM	7386	64GB	\$7067377649.95
IBM	7387	128GB	\$14134755249.95
IBM	7388	256GB	\$2826951049.95
IBM	7389	512GB	\$5653902049.95
IBM	7390	1GB	\$1130780449.95
IBM	7391	2GB	\$2261560849.95
IBM	7392	4GB	\$4523121649.95
IBM	7393	8GB	\$9046243249.95
IBM	7394	16GB	\$1809248649.95
IBM	7395	32GB	\$3618497249.95
IBM	7396	64GB	\$7236994449.95
IBM	7397	128GB	\$1447398849.95
IBM	7398	256GB	\$2894797649.95
IBM	7399	512GB	\$5789595249.95
IBM	7400	1GB	\$1157919049.95
IBM	7401	2GB	\$2315838049.95
IBM	7402	4GB	\$4631676049.95

Use The Internet Like A Pro.

Navigating the Internet Just Got Easier with WinGopher

Have you wanted access to the Internet without the hassle of typing complicated addresses or memorizing file locations? Do you lose valuable time wandering through a maze of servers and unwanted files? Now you can organize and simplify your Internet access with WinGopher™, a Microsoft® Windows™-based Gopher client.



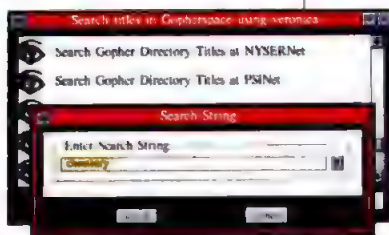
View multiple servers at one time.

WinGopher provides you with a graphical interface that uses pull-down menus and point-and-click functionality for easy Internet navigation. Using the Gopher

WinGopher	
Requirements for Gopher Clients	
Complete Package for Immediate Access	✓
Installation Support	✓
Users' Guide and Online Help	✓
Includes Text & Image Viewers & Telnet	✓
Supports Windows Sound and Video Viewers	✓
Supports Phone Books	✓
Enhanced Bookmarks	✓
Views Multiple Open Servers	✓
Supports Winsock Compatible TCP/IP Stacks	✓
Compatible with Other Windows Applications	✓

protocol, WinGopher supports Archie, Veronica, and WAIS searching. FTP transactions and Telnet sessions are supported, as well as any Windows sound or video

viewer. An image viewer and text viewer are included with WinGopher.



Pop-up windows for searches.

Why WinGopher?

WinGopher is a fully supported product, including installation phone support, user documentation, online help, and a bulletin board service. Backed by a leading automation firm, you're not left stranded should you need assistance.

WinGopher Solutions to Meet Your Needs

Whether you need a complete package to begin accessing the Internet, or you are already connecting to the Internet, WinGopher offers you the solution to meet your needs.

WinGopher provides you with a graphical interface to the Internet. It requires: Windows TCP/IP stack software (Winsock 1.1 compatible) and connection; 386 PC or higher with Windows 3.1 and DOS 5.0; 3.5 MB disk space and 2 MB more memory. **\$69.95**

Now Available - WinGopher Complete provides you with everything you need to start accessing the Internet immediately. Included are WinGopher, a Windows TCP/IP stack software package

(Winsock compatible), and an Internet connection through a leading national access provider. With WinGopher Complete, you get 30 free minutes of Internet connect time from a participating access provider. **\$129.00**

Call 1-800-55-NOTIS

FAX (708) 866-4970 • email: wingopher@notis.com

WinGopher™

GRAPHICAL INTERFACE FOR THE INTERNET
CIRCLE 858 ON READER SERVICE CARD

Arlington Computer Took a Long Term Business Perspective but Used PC Magazine for Immediate Results.

When Arly Guenther started Arlington Computer, he decided to take a long term approach by taking care of his customers so they would come back and become repeat buyers. According to Arly, this long term approach pervades everything they do — customer service, technical support, and advertising.

"When we started the company in early 1984," says Arly, "we believed that our success as a direct marketer would be tied to customer satisfaction. So we attempted to go into the direct advertising arena. Our strategy was to sell branded products at competitive prices while continually responding to the changing needs of our customer base. Two or three years ago, people might wait two or three weeks for a product. Now they want it overnight, and they want much more sophisticated technical support. After ten years of being in business, we really feel that our support is among the best in the industry."

When Arly chose the direct marketing channel, he knew the best way to maximize the return on his investment was to target business buyers that have enterprise-wide buying responsibility and buy many products in volume. He selected PC Magazine back in 1986 because its readers have the knowledge and responsibility to buy products for themselves and their organizations. In fact, because of the large volume buying, "PC Magazine has become Arlington's flagship publication, because its buyers buy many different types of products resulting in high average order sizes. All of this brings more revenue to the bottom line, and has allowed Arlington to grow to its present size."

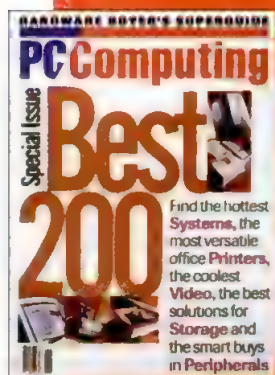
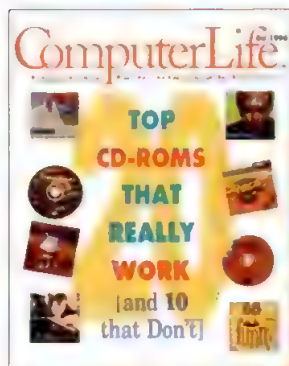
"If you're in direct marketing for the long term, PC Magazine is an excellent choice. We run ads in PC Magazine consistently and have not missed an issue since day one." As a result, "last year alone our sales from PC Magazine were up over 30%." So, if you want your advertising message to reach the broadest, most sophisticated customer base, PC Magazine is definitely the place to be.

If you're a direct marketer with a breakthrough idea, bring it to the attention of 1,000,000 of the most active and knowledgeable PC buyers. Call your PC Magazine sales representative or (212) 503-5100 and get the facts about PC Direct.



Arly Guenther
President, Arlington Computer

COMPUTER POWER!



STAY AT THE FOREFRONT OF THE COMPUTER REVOLUTION WITH ZIFF-DAVIS MAGAZINES.

COMPUTER LIFE

Here's the NEW magazine that helps you experience the magic of computing for yourself. Whether it's choosing, using and enjoying the best in multimedia, entertainment and games software...or adding CD-ROM, connecting online, or just getting organized — *Computer Life* helps you use your personal computer to enrich your life. Plus FREE SOFTWARE!

Call: 800-926-1578

PC MAGAZINE

It's the world's #1 information source for PC professionals, loaded with comprehensive product evaluations and benchmark test results from PC Magazine Labs — the most advanced computer product testing facility in the industry. Plus FREE SOFTWARE!

Call: 800-289-0429

PC/COMPUTING

Packed with comprehensive systems information and productivity-enhancing ideas, every issue helps you get your work done faster, smarter, and better than ever! Plus FREE SOFTWARE!

Call: 800-365-2770

MACUSER

Get concise product reviews, time-saving tips, power-boosting ideas, and new insights to help you get more out of your Mac and keep ahead of ever-changing Macintosh technology. Plus FREE SOFTWARE!

Call: 800-627-2247

WINDOWS SOURCES

Every issue is full of expert guidance, undocumented user tips, and hard-hitting details on how to choose and use the very best Windows™ products. Plus FREE SOFTWARE!

Call: 800-365-3414

COMPUTER GAMING WORLD

Get serious about playing and winning computer games with America's #1 computer game magazine. Full of special "winning secrets" for all your favorite games, on-target reviews of new games, details on multimedia, online gaming and more! Plus FREE SOFTWARE!

Call: 800-827-4450

COMPUTER SHOPPER

Every big issue delivers thousands of "smart-buy" deals on hardware, software and peripherals. It's America's largest computer marketplace!

Call: 800-274-6384



Ziff-Davis Publishing

One Park Avenue, Fifth Floor
New York, NY 10016

Please allow 30 days for delivery of first issue. If applicable, FREE software will be shipped upon payment.

Premier

The color showcase that puts the spotlight on leading-edge PC products and services.

387-395

Windows

An every-issue four color section featuring quality products for the Windows environment.

395

Classified

Flexible-format display advertising: computer systems, components, software and more.

396-410

BusinessCard

A forum for innovative, hard-to-find and low cost PC hardware, software and services.

413-414

HARDWARE

	PREMIER	CLASSIFIED
Batteries.....		
Boards/Components/Chips.....	388	396
Communications.....	388	
Computer Systems.....	389	396
Input/Data Acquisition/Barcode/POS.....	389	399
Mass Storage Devices.....	390	
Multi-Media.....	391	402
Music/Midi.....	392	
Networking.....	392	
Peripherals.....	392	
Power Supplies.....		
Security.....		
Video.....		
SOFTWARE	PREMIER	CLASSIFIED
Barcode.....		402
Business Applications.....	393	402
—Single-Solution.....		
Business Utilities.....		403
CD-ROM Titles.....		403
Cellular Phones.....		
Communications.....		403

Data Entry.....	
Database.....	
Desktop Publishing.....	
Education.....	394
Entertainment/Games.....	403
Financial/Accounting.....	
Foreign Languages/Font/Translation.....	403
Graphics/Design/CAD.....	404
—Digital Output Service.....	404
Health/Fitness/Nutrition.....	
Human Resource.....	
Mailing List Management.....	
Manufacturing/Inventory.....	
Mapping/Demographic.....	
Medical/Dental.....	
Multi-Media.....	394
Music/Midi.....	395
OS/2.....	
Personal.....	
Programming Tools/Languages.....	
Real Estate.....	
Religion.....	

Scientific/Engineering.....	395
Security.....	404
Shareware/Public Domain.....	
Statistical/Research.....	
Utilities.....	
Windows.....	
Adult.....	408
SERVICES	PREMIER
Computer Insurance.....	
Data Conversion/Data Recovery.....	405
Desktop Publishing.....	
On-Line.....	395
Scanning Services.....	
Software Duplication.....	406
Training/Tutorial.....	
MISCELLANEOUS	PREMIER
Accessories.....	
Books/Catalogs.....	
Business Opportunities.....	
Career Opportunities.....	
Supplies.....	407

SIMMIS

ALL SPEEDS AVAILABLE

1X3 \$38	2X38 \$329	8X38 Call
1X9 \$42	4X38 \$639	16X38 Call
4X9 \$136		
16X9 \$679		
1X38 \$158		

WE WILL BEAT ANY PRICE CONFIRMED!

WE WILL BEAT ANY ADVERTISED PRICE!

PACIFIC COAST MICRO INCORPORATED

4901 MORENA BLVD., SUITE 1111 • SAN DIEGO, CA 92117

FOR SALES CALL TOLL FREE
1-800-581-6040

Fax (619) 581-0125 Customer Service (619) 581-1439

P.O.s accepted from Universities and Qualified Firms

CD ROMS

MITSUBISHI

16 bit card \$180

TOSHIBA

TE800 16 bit card \$229

NEC

NEC 3200 16 bit card \$429

CREATIVE

DISCOVER 16 16 bit card \$180

TAPE DRIVES

Comet 250 \$145

Comet 250 \$145

Comet 250 \$145

MOTHERBOARDS

PENTIUM PCI P50

2mg to 128 mg 72 Pin Simms 4-72 pin Simms 512K Cache 4 PCI 2 Vesa 5 ISA 75 90 100 Selectable

INTEL 486 VLB \$1399

3VL 5 ISA Slots Award Bios SIS Chip Set 286socket 256 K-Cache

486 DX1-33 \$345

486 DX1-66 \$395

486 DX4-100 \$729

486 VLB 100 Pin \$195

PENTIUM PCI

3 VL 1 34 Slot 160 Memm Chip Set Phoenix Bios 286socket

586 P50 \$345

586 P50 \$345

586 P50 \$345

CYRIX 486 VLB

486 VLB 100 Pin \$195

IDM 486 SLC 2/66

411 Chip Set 486 SLC 2/66 \$249

486 SLC 2/66 VLB 289

VIDEO CARDS

486 VLB 100 Pin \$195

486 VLB 100 Pin \$195

486 VLB 100 Pin \$195

DIAMOND PRODUCTS

486 VLB 100 Pin \$195

486 VLB 100 Pin \$195

486 VLB 100 Pin \$195

INTEL 14.4 PCMCIA FAX MODEM \$189

INTEL 14.4 PCMCIA FAX MODEM \$189

INTEL 14.4 PCMCIA FAX MODEM \$189

SCSI DRIVES

MAXTOR 80T5402L 540mg \$479

MAXTOR 80T5402L 540mg \$479

MAXTOR 80T5402L 540mg \$479

CD ROMS

MITSUBISHI

16 bit card \$180

TOSHIBA

TE800 16 bit card \$229

NEC

NEC 3200 16 bit card \$429

CREATIVE

DISCOVER 16 16 bit card \$180

TAPE DRIVES

Comet 250 \$145

Comet 250 \$145

Comet 250 \$145

MOTHERBOARDS

PENTIUM PCI P50

2mg to 128 mg 72 Pin Simms 4-72 pin Simms 512K Cache 4 PCI 2 Vesa 5 ISA 75 90 100 Selectable

INTEL 486 VLB \$1399

3VL 5 ISA Slots Award Bios SIS Chip Set 286socket 256 K-Cache

486 DX1-33 \$345

486 DX1-66 \$395

486 DX4-100 \$729

486 VLB 100 Pin \$195

PENTIUM PCI

3 VL 1 34 Slot 160 Memm Chip Set Phoenix Bios 286socket

586 P50 \$345

586 P50 \$345

586 P50 \$345

CYRIX 486 VLB

486 VLB 100 Pin \$195

IDM 486 SLC 2/66

411 Chip Set 486 SLC 2/66 \$249

486 SLC 2/66 VLB 289

VIDEO CARDS

486 VLB 100 Pin \$195

486 VLB 100 Pin \$195

486 VLB 100 Pin \$195

DIAMOND PRODUCTS

486 VLB 100 Pin \$195

486 VLB 100 Pin \$195

486 VLB 100 Pin \$195

INTEL 14.4 PCMCIA FAX MODEM \$189

INTEL 14.4 PCMCIA FAX MODEM \$189

INTEL 14.4 PCMCIA FAX MODEM \$189

SCSI DRIVES

MAXTOR 80T5402L 540mg \$479

MAXTOR 80T5402L 540mg \$479

MAXTOR 80T5402L 540mg \$479

IDE HARD DRIVES

Maxtor

MAXTOR 80T5402L 540mg \$479

MAXTOR 80T5402L 540mg \$479

MAXTOR 80T5402L 540mg \$479

Seagate

SEAGATE 80T5402L 540mg \$479

SEAGATE 80T5402L 540mg \$479

SEAGATE 80T5402L 540mg \$479

WESTERN DIGITAL

WESTERN DIGITAL 80T5402L 540mg \$479

WESTERN DIGITAL 80T5402L 540mg \$479

WESTERN DIGITAL 80T5402L 540mg \$479

SCSI DRIVES

MAXTOR 80T5402L 540mg \$479

MAXTOR 80T5402L 540mg \$479

MAXTOR 80T5402L 540mg \$479

CONTROLLER BOARDS

486 VLB 100 Pin \$195

486 VLB 100 Pin \$195

486 VLB 100 Pin \$195

SPECIALS

INTEL 14.4 PCMCIA FAX MODEM \$189

INTEL 14.4 PCMCIA FAX MODEM \$189

INTEL 14.4 PCMCIA FAX MODEM \$189

IDE HARD DRIVES

Maxtor

MAXTOR 80T5402L 540mg \$479

MAXTOR 80T5402L 540mg \$479

MAXTOR 80T5402L 540mg \$479

Seagate

SEAGATE 80T5402L 540mg \$479

SEAGATE 80T5402L 540mg \$479

SEAGATE 80T5402L 540mg \$479

WESTERN DIGITAL

WESTERN DIGITAL 80T5402L 540mg \$479

WESTERN DIGITAL 80T5402L 540mg \$479

WESTERN DIGITAL 80T5402L 540mg \$479

SCSI DRIVES

MAXTOR 80T5402L 540mg \$479

MAXTOR 80T5402L 540mg \$479

MAXTOR 80T5402L 540mg \$479

CD ROMS

MITSUBISHI

16 bit card \$180

TOSHIBA

TE800 16 bit card \$229

NEC

NEC 3200 16 bit card \$429

CREATIVE

DISCOVER 16 16 bit card \$180

TAPE DRIVES

Comet 250 \$145

Comet 250 \$145

Comet 250 \$145

MOTHERBOARDS

PENTIUM PCI P50

2mg to 128 mg 72 Pin Simms 4-72 pin Simms 512K Cache 4 PCI 2 Vesa 5 ISA 75 90 100 Selectable

INTEL 486 VLB \$1399

3VL 5 ISA Slots Award Bios SIS Chip Set 286socket 256 K-Cache

486 DX1-33 \$345

486 DX1-66 \$395

486 DX4-100 \$729

486 VLB 100 Pin \$195

PENTIUM PCI

3 VL 1 34 Slot 160 Memm Chip Set Phoenix Bios 286socket

586 P50 \$345

586 P50 \$345

586 P50 \$345

CYRIX 486 VLB

486 VLB 100 Pin \$195

IDM 486 SLC 2/66

411 Chip Set 486 SLC 2/66 \$249

486 SLC 2/66 VLB 289

VIDEO CARDS

486 VLB 100 Pin \$195

486 VLB 100 Pin \$195

486 VLB 100 Pin \$195

DIAMOND PRODUCTS

486 VLB 100 Pin \$195

486 VLB 100 Pin \$195

486 VLB 100 Pin \$195

INTEL 14.4 PCMCIA FAX MODEM \$189

INTEL 14.4 PCMCIA FAX MODEM \$189

INTEL 14.4 PCMCIA FAX MODEM \$189

SCSI DRIVES

MAXTOR 80T5402L 540mg \$479

MAXTOR 80T5402L 540mg \$479

MAXTOR 80T5402L 540mg \$479

IDE HARD DRIVES

Maxtor

MAXTOR 80T5402L 540mg \$479

MAXTOR 80T5402L 540mg \$479

MAXTOR 80T5402L 540mg \$479

Seagate

SEAGATE 80T5402L 540mg \$479

SEAGATE 80T5402L 540mg \$479

SEAGATE 80T5402L 540mg \$479

WESTERN DIGITAL

WESTERN DIGITAL 80T5402L 540mg \$479

WESTERN DIGITAL 80T5402L 540mg \$479

WESTERN DIGITAL 80T5402L 540mg \$479

SCSI DRIVES

MAXTOR 80T5402L 540mg \$479

MAXTOR 80T5402L 540mg \$479

MAXTOR 80T5402L 540mg \$479

CONTROLLER BOARDS

486 VLB 100 Pin \$195

486 VLB 100 Pin \$195

486 VLB 100 Pin \$195

SPECIALS

INTEL 14.4 PCMCIA FAX MODEM \$189

INTEL 14.4 PCMCIA FAX MODEM \$189

INTEL 14.4 PCMCIA FAX MODEM \$189

IDE HARD DRIVES

Maxtor

MAXTOR 80T5402L 540mg \$479

MAXTOR 80T5402L 540mg \$479

MAXTOR 80T5402L 540mg \$479

Seagate

SEAGATE 80T5402L 540mg \$479

SEAGATE 80T5402L 540mg \$479

SEAGATE 80T5402L 540mg \$479

WESTERN DIGITAL

WESTERN DIGITAL 80T5402L 540mg \$479

WESTERN DIGITAL 80T5402L 540mg \$479

WESTERN DIGITAL 80T5402L 540mg \$479

SCSI DRIVES

MAXTOR 80T5402L 540mg \$479

MAXTOR 80T5402L 540mg \$479

MAXTOR 80T5402L 540mg \$479

CD ROMS

MITSUBISHI

16 bit card \$180

TOSHIBA

TE800 16 bit card \$229

NEC

NEC 3200 16 bit card \$429

CREATIVE

DISCOVER 16 16 bit card \$180

TAPE DRIVES

Comet 250 \$145

Comet 250 \$145

Comet 250 \$145

MOTHERBOARDS

PENTIUM PCI P50

2mg to 128 mg 72 Pin Simms 4-72 pin Simms 512K Cache 4 PCI 2 Vesa 5 ISA 75 90 100 Selectable

INTEL 486 VLB \$1399

3VL 5 ISA Slots Award Bios SIS Chip Set 286socket 256 K-Cache

486 DX1-33 \$345

486 DX1-66 \$395

486 DX4-100 \$729

486 VLB 100 Pin \$195

PENTIUM PCI

3 VL 1 34 Slot 160 Memm Chip Set Phoenix Bios 286socket

586 P50 \$345

586 P50 \$345

586 P50 \$345

CYRIX 486 VLB

486 VLB 100 Pin \$195

IDM 486 SLC 2/66

411 Chip Set 486 SLC 2/66 \$249

486 SLC 2/66 VLB 289

VIDEO CARDS

486 VLB 100 Pin \$195

486 VLB 100 Pin \$195

486 VLB 100 Pin \$195

DIAMOND PRODUCTS

486 VLB 100 Pin \$195

486 VLB 100 Pin \$195

486 VLB 100 Pin \$195

INTEL 14.4 PCMCIA FAX MODEM \$189

INTEL 14.4 PCMCIA FAX MODEM \$189

INTEL 14.4 PCMCIA FAX MODEM \$189

SCSI DRIVES

MAXTOR 80T5402L 540mg \$479

MAXTOR 80T5402L 540mg \$479

MAXTOR 80T5402L 540mg \$479

IDE HARD DRIVES

Maxtor

MAXTOR 80T5402L 540mg \$479

MAXTOR 80T5402L 540mg \$479

MAXTOR 80T5402L 540mg \$479

Seagate

SEAGATE 80T5402L 540mg \$479

SEAGATE 80T5402L 540mg \$479

SEAGATE 80T5402L 540mg \$479

WESTERN DIGITAL

WESTERN DIGITAL 80T5402L 540mg \$479

WESTERN DIGITAL 80T5402L 540mg \$479

WESTERN DIGITAL 80T5402L 540mg \$479

SCSI DRIVES

MAXTOR 80T5402L 540mg \$479

MAXTOR 80T5402L 540mg \$479

MAXTOR 80T5402L 540mg \$479

CONTROLLER BOARDS

486 VLB 100 Pin \$195

486 VLB 100 Pin \$195

486 VLB 100 Pin \$195

SPECIALS

INTEL 14.4 PCMCIA FAX MODEM \$189

INTEL 14.4 PCMCIA FAX MODEM \$189

INTEL 14.4 PCMCIA FAX MODEM \$189

IDE HARD DRIVES

Maxtor

MAXTOR 80T5402L 540mg \$479

MAXTOR 80T5402L 540mg \$479

MAXTOR 80T5402L 540mg \$479

Seagate

SEAGATE 80T5402L 540mg \$479

SEAGATE 80T5402L 540mg \$479

SEAGATE 80T5402L 540mg \$479

WESTERN DIGITAL

WESTERN DIGITAL 80T5402L 540mg \$479

WESTERN DIGITAL 80T5402L 540mg \$479

WESTERN DIGITAL 80T5402L 540mg \$479

SCSI DRIVES

MAXTOR 80T5402L 540mg \$479

MAXTOR 80T5402L 540mg \$479

MAXTOR 80T5402L 540mg \$479

MEMORY FOR ALL NOTEBOOKS & LASER PRINTERS!

SAME DAY SHIPPING AVAILABLE IF ORDER PLACED BY 2:30 P.M. P.S.T. HOURS: MON-FRI 7AM-5:30PM P.S.T. SAT. 10AM-2PM P.S.T.

Shipping is non-refundable • No cancellations or special order items • 20% Restocking fee on returns within 30 days • No returns after 30 days • Warranty replacement only • All prices final • Prices subject to change

TARGET YOUR PREY!



Bag Your Voice Processing Objective

- ◆ VOICE MAIL
- ◆ AUTO-TRANSFER
- ◆ FAX-ON-DEMAND

Complete your mission for as little as \$295.

CALL 1-800-945-4884

510-522-3800 • FAX 510-522-5556
We target developers/OEMs

TALKING TECHNOLOGY, INC.
1125 Atlantic Ave. • Alameda, CA 94501



CIRCLE 752 ON READER SERVICE CARD

REMOTE POWER ON/OFF

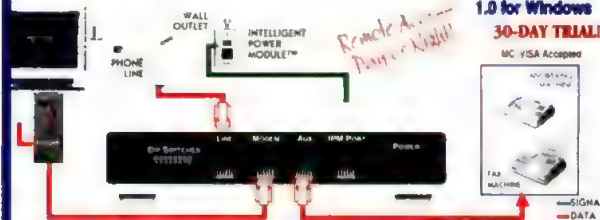
\$169.95

- Power on your PC from anywhere in the world!
- Reboot a Locked-up Remote PC.
- Share a Modem & Fax Machine on a single phone line.

\$199.95

wpcANYWHERE
1.0 for Windows
30-DAY TRIAL!

MC VISA Accepted



Server Technology • 1288 Hammerwood • Sunnyvale, CA 94089 • Ph 408-745-0300 • Fax 408-745-0392

TO ORDER CALL 1-800-835-1515

CIRCLE 755 ON READER SERVICE CARD

ROM BIOS UPGRADES

Do you need new AMI, Award, MR BIOS or Phoenix BIOS?

- Support Windows 3.1
- Support 1 2/1, 44/2, 88MB
- Floppy Drives
- User defined hard drive types
- Enhanced 101, 102 keyboard
- 100% IBM compatible
- Hard drive support beyond 1K cylinders
- 32 bit block mode transfer
- Four floppy support
- Four serial port support
- DOS 6 X
- Three levels of password protection
- Complete set up in ROM

WE ARE THE OLDEST AND LARGEST BIOS UPGRADE IN THE WORLD. GUARANTEED LOWEST PRICES ALL THE TIME.

ORDER TODAY!
1-800-800-BIOS

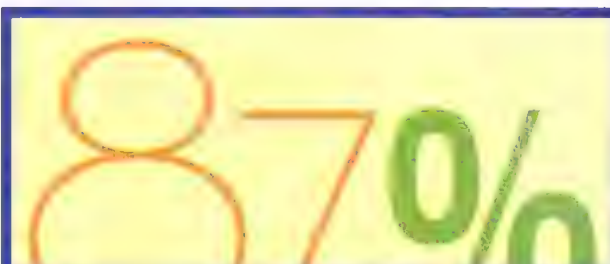
MA F.L.A. OFFICES (7467)
RETURN MAIL/SHIPPING TO A RESELLER 100



1550 TURNPIKE ST. • NORTH ANDOVER, MA 01845
(508) 688-6468 • FAX (508) 683-1630

ACER AMI AST COMPAQ DELL DTK IBM EPSON EVEREX GATEWAY HYUNDAI KAYPRO LEADING EDGE
MINIWARE OSMONICS SAMSUNG SANYO SPECTRA TADPO TRELLS AMERICAN BROTHER AND MANY MORE!

CIRCLE 753 ON READER SERVICE CARD



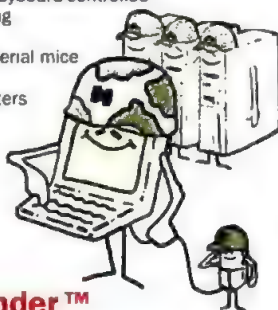
OF PC MAGAZINE SUBSCRIBERS WHO KNOW MARKETPLACE HAVE PURCHASED HARDWARE IN THE PAST 12 MONTHS OR WOULD CONSIDER DOING SO, AFTER SEEING AN AD IN THE SECTION. SHOULDN'T YOU SEE YOUR AD HERE? CALL 800-825-4237 TODAY!

Control up to four PCs or file servers with just 1 keyboard, monitor and mouse!

Get the same great features of our AutoBoot™ Commander in a smaller, more 'personal' size. Measuring under 8" across, the Personal Commander lets you work smarter in cramped areas!

- Supports all 100% IBM compatible PCs, with optional Macintosh and Sun workstation support available
- KeyScan™ feature allows for keyboard-controlled channel scanning and switching
- Built in support for PS/2 and serial mice
- AutoBoot feature boots computers without operator intervention

To control over four PCs, Macs or Sun workstations, ask for our AutoBoot Commander!



Personal Commander™

IBM, PC and PS/2 are registered trademarks of International Business Machines Corp. Macintosh and Mac are registered trademarks of Apple Computer, Inc. Sun is a registered trademark of Sun Microsystems.

Cybox Corporation
4912 Research Drive • Huntsville, AL 35805 USA
(205) 430-4000 • FAX (205) 430-4030

Make your PC peripherals Macintosh compatible!

Mediator lets you use your PS/2 style peripherals just as if they were connected directly to your Mac! Use the Cybox AutoBoot Commander in conjunction with the Mediator to control a mixture of PCs and Macs from a single keyboard, monitor and PS/2 mouse. Or allow several users to share a Mac with PC Expander Plus™. With the Mediator, going multiplatform is easy!

- Compatible with most Macintosh computers with detachable monitors
- Supports VGA, SVGA and Macintosh HiRes video
- Supports PS/2 style keyboard, mouse or peripherals

For Sun™ workstation support, ask about our Mediator for Sun!



Mediator™ for Macintosh



CIRCLE 754 ON READER SERVICE CARD

100MHz PowerBrick

Have Your Power and Take It Too!

For no compromise on-the-go use, the PowerBrick is the fastest, most capable notebook available. Enjoy blazing performance with the latest 100MHz 486DX4 CPU and the mobility of a light 6lb PC. Other features include 4-32MB RAM, accelerated local bus graphics and hard disk with up to 525MB of capacity (1 GB with Doublespace). The backlit 9.5" LCD is available in mono, Dual Scan or Active Color and all feature 1280x1024 ext. VGA. For expansion, two PCMCIA Type II cards plus an internal 14-14 fax/modem can be utilized while the expansion chassis holds two full length ISA cards.

from **\$2,295**

4-Year GE Service Warranty Included



Other New NoteBricks The Color SubBrick 50

50 MHz 486DX2, Dual Scan Color, 3.9 lbs 7" x 10" x 1.4" thick, 2 Type II PCMCIA, 260MB HD, up to 20MB RAM, 4 Hr Battery life -

from **\$2,495**

Call M-F, 9-6 EST

800-633-1925

The Ergo Difference!

- 4-year warranty
- Same day shipment
- RescueMe next day loaner
- Affordable leases
- Satisfaction guaranteed

ergo
COMPUTING

24Hr. Automatic FAX Info
800-723-0778
code 1483

One Intercontinental Way, Peabody, MA 01960 (508)535-7510 FAX (508) 535-7512

CIRCLE 756 ON READER SERVICE CARD

Bright color. Bright price.

\$2,299.



The BOXLIGHT 1280 ColorShow Projection Panel. Our Brightest true-color panel. And for \$700 off the list price, it's an unbeatable value.

- ◆ Compact, easy-travel panel
- ◆ 640 x 480 resolution
- ◆ PC and Mac compatible
- ◆ FREE remote and cables

Your direct source for all the bright answers.

- ◆ Widest selection
- ◆ Instant availability
- ◆ Overnight shipping
- ◆ 30-day guarantee



BOXLIGHT

17771 Eryd Dr. N.E. Peabody, MA 01960
200-779-7811 or Payment Visa, MasterCard,
American Express, Discover, Novus, Diners Club
VISA, MasterCard, American Express, Discover, Novus, Diners Club

Call Today 1-800-497-4008

CIRCLE 758 ON READER SERVICE CARD

Smart Power at Your Fingertips

SmartBook II The Ultimate Business Power Notebook

486SX 25/33

486DX 33

486DX2-50/66

SL Enhanced

Upgradable CPU

DX2-66

Upgradable

RAM and HDD

Up to 32MB Memory

Up to 524MB HDD

32MB RAM
524MB HDD

Built in Sound
Capabilities for
Multimedia



Audio Speaker
& Microphone

1MB
Video

- 9.5" Upgradable LCD Panel
- VESA Local Bus video
- 1 MB of video memory

Double Your Battery
Life Up to 8 Hours

NiMH
Battery

Ergonomically
Designed Keyboard
with Huge 25mm
Trackball Mouse

PACKED WITH POWER!

- Powerful - 486 SL Enhanced CPU
- Long Lasting - Double NiMH Batteries up to 8 Hours
- Fast - VESA Local Bus Video and 1MB Video Memory
- Flexible - Up to 32MB RAM and 524MB HDD

Active Matrix.....\$3,225
Dual Scan\$2,250
Monochrome.....\$1,690

STANDARD FEATURES

- 4MB of RAM Standard
- 120MB Upgradable HDD
- PCMCIA Expandability
- Built-in Audio Capability
- Rechargeable Battery
- IBM PC-DOS 6.1
- Windows 3.11
- Carrying Case
- Optional Docking Station, Fax Modem, Lan Adapter

COMMAX
TECHNOLOGIES, INC.

1-800-5-COMMAX

2031 Concourse Drive, San Jose, CA 95131
In Calif: (408)435-5000 • FAX:(408)435-5005

East Coast Distributor:

Hi-Link

934 Hope Street
Stamford, CT 06907
1-800-683-9535

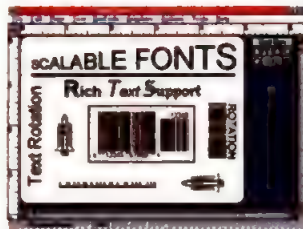


CIRCLE 757 ON READER SERVICE CARD

The Next Generation in Label Design Software

LabelWorks™

for Windows



LabelWorks sets the new performance standard for professional quality label design. No other program combines such easy operation with this much power!

- Provides Desktop Publishing features to enhance label design. Features include: WYSIWYG, rulers, guides, page zooms, lines, shapes.
- Rich text support allows you to edit font styles, types, and sizes within the same line.
- Supports all major Bar Code symbologies, including Code 39, 93, 128, POSTNET, UPC, Bookland EAN, 19 types in all.
- Imports & Exports using TIFF, GIF, BMP, PCX, WPG, WMF, TARGA graphic files.
- Rotates Text, Bar Codes and imported graphics in 90 degree increments.
- Prints labels on virtually any windows supported printer.
- Prints labels directly from dBase, DIF & ASCII files.

Dealer Inquiries Welcome.

Call for Free DEMO Software



AMERICAN MICROSYSTEMS

2190 Regal Parkway, Euless, TX 76040

(800) 648-4452 (817) 571-9015 FAX (817) 685-6232

Tape Solutions

QUALSTAR®

...The Tape Experts

- Top Quality
- High Performance
- Proven Reliability
- Easy to Use
- Best Price
- Total Support
- Factory Direct
- Made in the U.S.A.

9-TRACK #
3480/3490

Data Interchange for
DOS, NOVELL, UNIX,
WINDOWS AND OS/2



6709 Independence Ave.
Canoga Park, CA 91303
FAX (818) 592-0116
Tel (818) 592-0061
Tel (800) 468-0680

CIRCLE 762 ON READER SERVICE CARD

New Products Expand Award Winning Tape Systems Family!

NOW all of the features of the PCTD product family that earned PC Magazine praise... has an excellent nine-track tape system for PCs... says Frank Bertler Jr., PCMagazine July 1992. Available is a complete kit of NineTrack 3480/3490 SCSI Controller Kit and tape subsystem solutions. Like the PCTD line, the new SCSI kit reads/writes to 9-track and 3480/3490 tape with your IBM® PC/XT/AT® 386/486 PS/2® and compatibles. Exchange data with other PCs, minis and mainframes using a variety of tape formats.

3480/3490 (IBRC) & NineTrack system features:

- 420 & 480 capacities
- 1500 bpi, 1600 bpi, 1600 bpi, 1600 bpi
- 1500 bpi, 1600 bpi, 1600 bpi, 1600 bpi
- 1500 bpi, 1600 bpi, 1600 bpi, 1600 bpi
- 1500 bpi, 1600 bpi, 1600 bpi, 1600 bpi
- 1500 bpi, 1600 bpi, 1600 bpi, 1600 bpi
- 1500 bpi, 1600 bpi, 1600 bpi, 1600 bpi
- 1500 bpi, 1600 bpi, 1600 bpi, 1600 bpi



CHI

800-828-0599

Fax 216-330-8000

CIRCLE 763 ON READER SERVICE CARD

PCs, Workstations

9-Track
Incredibly compact, super reliable.
1600, 6250 bpi. Great price!

3480
Smallest, lightest in the world.
super reliable. Low price!

800-729-8725
Includes software, PC controller

Overland Data
Your best choice for 1/2 inch
tape solutions since 1980

619-571-5555
FAX 619-571-0982
Europe (+44) 734-891891
FAX (+44) 734-891897

CIRCLE 765 ON READER SERVICE CARD

Will your 9-Track Subsystem...



- ✓ Offer tape speeds from 100 to 150 ips?
- ✓ Read and Write all four 9-Track Densities?
- ✓ Work in concert with other SCSI-2 devices?
- ✓ Be backed by a company who has produced 9-Track drives for over 20 years?

Features like these make **M4's** solutions the only choice for your demanding high performance applications.

....3480/90 Solutions also in-stock

M4

10855 Sorrento Valley Rd. San Diego, CA 92121
619-597-0816 Fax: 619-597-0836

800-240-8270

8 AM Eastern to 5 PM Pacific

CIRCLE 764 ON READER SERVICE CARD

SyQuest TECHNOLOGY

Unlimited data storage at blazing 13 ms access speed and up to 4 MB/s transfer rate. Wake up DOS & Windows world to the SyQuest storage technology that dominates the media service bureau industry.

with a 98.5% penetration. It obliterates optical technology with its speed and low cost. Can you imagine 270 MB on a disk the size of your floppy diskette. Available in the Liberty small form factor (shown left) with or without internal battery or as an internal kit for your PC. Never run out of storage again, throw away those slow backup tapes and be on line immediately.

SyQuest 270MB 3.5" REMOVABLE CARTRIDGE DRIVE
13 ms

Liberty

3754 Saratoga Ave.
San Jose, CA 95129

(408) 983-1127
Fax (408) 243-2885

CIRCLE 761 ON READER SERVICE CARD

9 TRACK/3480/CDROM

WINDOWS DOS NOVELL OS2 UNIX

WINDOWS TAPE SOFTWARE!
TAPE BACKUP/CONVERSION
TAPE DUPLICATION
CD ROM MAKER



LAGUNA DATA SYSTEMS

7340 Smoke Ranch Road Suite C,
Las Vegas, NV 89128
TEL (702) 254-2648 FAX (702) 254-0910



800-938-TAPE

CIRCLE 766 ON READER SERVICE CARD

PREMIER

\$349

800/356-3931

For questions and a dealer nearest
you, call us at 800/356.3931
or 503/871.9066

**CONSUMER
TECHNOLOGY**

OF ~~THE~~ MAGAZINE SUBSCRIBERS WHO KNOW
MARKETPLACE HAVE PURCHASED SOFTWARE IN
THE PAST 12 MONTHS, OR WOULD CONSIDER
DOING SO, AFTER SEEING AN AD IN THE SECTION.

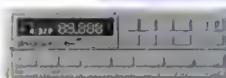


TV Elite.
Easily the Best

WinRadio tm

\$ 89

(Plus 50% S&H)



Email orders: • Wake-up and Sleep I
Internet: smtct@ix.netcom.com
C'serve: 74643.2415@Compuserve.com

1-800-832-7070

Each sold separately at \$54.95

SOUND MINDS

Technology Inc
1600 Dell Ave #3 Campbell CA 95008
Ph (408) 374-7070 Fax (408) 374-7193

CIRCLE 768 ON READER SERVICE CARD



Always Key
\$CALL

1-800-863-ADDA

ADDA
ADDA TECHNOLOGIES, INC.
 48501 Warm Springs Blvd.,
 Suite #109, Fremont, CA 94539

USA Tel 510-770-9899 Fax 510-623-1803
Canada Tel 604-278-3224 Fax 604-278-2909

FRactal Frenzy

\$ 29.95
\$ 39.95
\$ 39.95
\$ 49.95
\$ 29.95
\$ 29.95
\$ 39.95
\$ 39.95
\$ 29.95
\$ 39.95
\$ 39.95
\$ 39.95
\$ 39.95
\$ 39.95
\$ 39.95
\$ 59.95
\$ 29.95
\$ 39.95
\$ 39.95
\$ 49.95
\$ 39.95
\$ 39.95
\$ 4.95

* Shareware programs require separate payment to authors if found useful
per order: \$ 5.00 for Domestic, \$ 10.00 for International orders

800-786-9997

+1 510 674-0783

Email: orders@cdrom.com

Fax +1 510 674-0821

Walnut Creek CDROM

4041 Pike Lane, Suite D-512
Concord CA 94520

Dealer Inquiries Welcome

CIRCLE 769 ON READER SERVICE CARD

SEPTMBER 27, 1994 PC MAGAZINE 391

MASS STORAGE DEVICES - MULTI-MEDIA

Learn To Play The Piano, Create
And Print Your Own Music, And Jam With
Your Own Computerized Band!

C R E S C E N D O™

Music Upgrade Kit

Crescendo™ is the perfect music upgrade ... even if you already have a sound card or an upgrade kit.

Besides adding crystal clear Wavetable synthesis to your computer, Crescendo entertains, educates and opens the door to the wonderful world of music.

Crescendo includes ■ the Maui™ wavetable synthesizer card, with SampleStore™ technology, and 128 General MIDI instruments ■ a full-size, professional 49-key music keyboard ■ The Miracle Piano Teaching System™ software — hundreds of thousands of people have already been taught by this ingenious, interactive, serious musical educational system ■ Wave/SE™ sound editor, which lets you tailor .WAV files for use with SampleStore ■ Stratos™ MIDI sequencer software to record and play back your musical creation ■ and Band-In-A-Box™ musical accompaniment software with 24 different musical styles.

Visit your favorite dealer, or call **800-645-5840** for more information today!

TURTLE BEACH SYSTEMS

52 Grumbacher Road • York, Pennsylvania 17402 • 717-767-0200 • FAX: 717-767-6033

All trademarks are registered by their respective companies. Specifications may change without notice.

CIRCLE 771 ON READER SERVICE CARD

KEYS • KEYBOARD TEMPLATES

MOUSE PADS • KEYTOP OVERLAYS

Your keyboard will never be the same!

Offering the widest selection of customized replacement keys to suit any keyboard make or model.

CUSTOM SERVICES

1-800-459-7931

DATA CAL

...Making You More Productive

531 East Elliot Road • Chandler, AZ • 85225 • 602-813-3100

KEY # PCMC1



OF SUBSCRIBERS WHO KNOW
MARKETPLACE HAVE PURCHASED SOFTWARE IN
THE PAST 12 MONTHS. OR WOULD CONSIDER
DOING SO, AFTER SEEING AN AD IN THE SECTION.

Share More.



The most flexible printer sharing solution available just became more productive! Now, you can connect up to 32 computers to as many as 8 printers and have file transfer and printer spooling capability at no additional cost. Installs in minutes using standard RJ-11 phone cable.

Call These
Distributors:

SED
1-800-444-6962
800-FAX-28ED

LANE
1-800-826-7904
1-800-331-2841 (PAID)

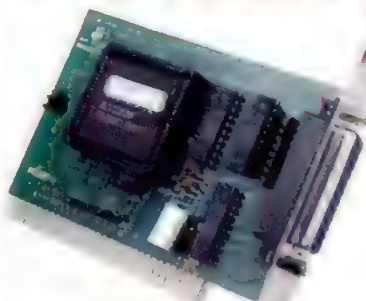
DATA CAL
1-800-4-CABLE-1
1-800-452-2831

PRIMAX

PRIMAX ELECTRONICS

CIRCLE 772 ON READER SERVICE CARD

POWER PRINTING - 150,000 cps



Plug the BuffPort™ into your PC and print to any parallel printer or device. Transfer data from your PC as fast as the printer can accept it, up to 150,000 cps. (A standard PC parallel port is typically limited to about 10,000 cps.) Use the BuffPort with the HWP for a 150,000 cps printer sharing system!

If you have an older printer that does not have an high-speed interface, then connect a CPR buffer to the end of your printer cable and send from the BuffPort at 100,000 cps. The CPR also works as a printer buffer with a standard PC parallel port, but would be limited to the PC port's speed.

BUFFALO is a registered trademark of Melco, Inc. BuffPort is a trademark of Buffalo, Inc.



SIMMs:

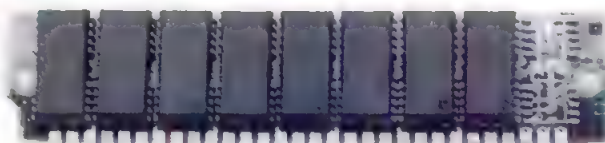
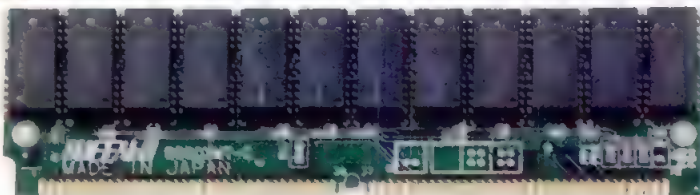
1 x 36 & 32

2 x 36 & 32

4 x 36

4 x 8, 1 x 3

PCMCIA



2805 19th St. SE, Salem, OR 97302-1520 FAX: (503) 585-4505

Printer Sharing:

SL 6 ser. & 4 par.

SLP 2 ser. & 8 par.

HWP 5 parallel ports

HXM 2 ser. & 2 par.

HXS 4 serial ports

ASB 5 parallel ports

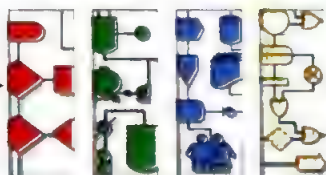
(800) 345-2356

CIRCLE 774 ON READER SERVICE CARD

EasyFlow™

Easier
than ABC!

...the **EASIEST** flowcharter
...the most **ADVANCED** charting technology



Five reasons to buy EasyFlow

- SmartLines™ route & reroute themselves
- Text formats to the contour of shapes
- Text moves when lines move
- Print diagrams up to 10' by 10' in wall or binder format (with automatic off-page connectors)
- Drag & drop editing saves hours in revisions



System Administrator
1-800-267-0668
(013) 322-0055

EasyFlow is a registered trademark & SmartLines is a trademark of HavenTree Software Limited

CIRCLE 775 ON READER SERVICE CARD

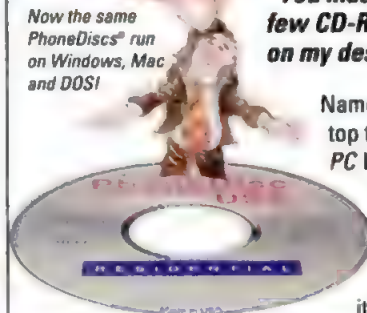
THE LEADING PC MAGAZINES AGREE:

PhoneDisc® is the fastest way to find anyone, anywhere!

Now the same
PhoneDiscs® run
on Windows, Mac
and DOS!

"You must buy this....one of the few CD-ROM sets that I keep on my desk."

—John Dvorak,
PC MAGAZINE.



Named one of PC Computing's top two business CDs; one of PC World's top twenty-five, PhoneDisc® has 91 million total listings, 21 million more than its leading competitor – and it's 50% more accurate.

RESIDENTIAL \$79 Find 81 million numbers, addresses, even zip codes in a fraction of the time, and at a fraction of the cost of directory assistance calls. Download, print and dial.

BUSINESS \$79 Identify 9.5 million business names from just a phone number or street address; business type or SIC code.

PowerFinder™ \$249 The master investigative tool.™ Developed for government agencies. Features include search by number and address of 91 million residential and business listings on five regional discs.

1-800-284-8353

PhoneDisc® USA

The fastest way to find anyone, anywhere!

Digital Directory Assistance, Inc.
6931 Arlington Rd. Suite 405
Bethesda, MD 20814-5231

CIRCLE 776 ON READER SERVICE CARD



Video Training for Windows Applications

Your Personal Windows Training Specialists



Special Microsoft Office Video Training

Microsoft Office 4.0 Standard (11 videos/13 hours)\$299.95
Microsoft Office 4.0 Pro (13 videos/24 hours)\$495.95
Microsoft Office 4.0 Plus (15 videos/27 hours)\$579.95



Special Lotus SmartSuite Video Training

Lotus SmartSuite 2 Standard (11 videos/13 hours)\$299.95
Lotus SmartSuite 2 Pro (13 videos/24 hours)\$495.95
Lotus SmartSuite 2 Plus (15 videos/27 hours)\$579.95



Special Borland Office Video Training

Borland Office 2.0 Standard (11 videos/13 hours)\$239.95
Borland Office 2.0 Pro (13 videos/24 hours)\$349.95
Borland Office 2.0 Plus (15 videos/27 hours)\$429.95



MS Office Integration Video

STANDARD PUBLISHED AUTHORITY
MS Office Combination (Reg. \$49.95)



Dawn Bjork
Corporate Trainer
& MS Windows Instructor

Word 6.0

Beg/Int/Adv (ea) \$49.95
Desktop Publishing \$49.95
Mail Merge/Forms \$49.95
Any Three Videos \$149.95

PowerPoint 4.0

Beg/Int/Adv (ea) \$49.95
Any Three Videos \$149.95

WordPerfect 6.0

Beg/Int/Adv (ea) \$49.95
Desktop Publishing \$49.95
Any Three Videos \$149.95
5.2 to 6.0 Upgrade \$49.95

Many Other Titles Available
Call for Details



Dave Bellamy
MS Excel Specialist
& MS Excel/Project Instructor

Excel 5.0

Beginning \$49.95
Intermediate \$49.95
Advanced \$49.95
Any Three Videos \$149.95

Project 4.0

Level 1/II/III/IV (ea) \$79.95
All Three Videos \$239.95

Lotus 1-2-3 Anti

Level 1-2-3 (ea) \$79.95
All Three Videos \$239.95

Ami Pro 3.0

Beg/Int/Adv (ea) \$49.95
All Three Videos \$149.95



Alison Balter
Corporate/Soft. Trainer
& MS Access 2.0 Instructor

Access 2.0

Beg/Int/Adv (ea) \$49.95
All Three Videos \$129.95

Visual Basic 3.0

Unit 1/2/3 (ea) \$89.95
All Three Videos \$269.95

V.B. for Apps

Level 1-2-3 (ea) \$79.95
All Three Videos \$239.95

Paradox 4.5

Beg/Int/Adv (ea) \$49.95
All Three Videos \$129.95



Mark Wright
National Seminar Trainer
& MS Windows Instructor

Windows 3.1

Beginning \$49.95
Advanced \$49.95
Begin/Int/Adv (ea) \$89.95
DOS & Win Basics \$49.95

CorelDRAW 4

Beg/Int/Adv (ea) \$59.95
All Three Videos \$179.95

Quicken 3.0

Basics \$49.95
Power Features \$49.95

PageMaker 5.0

Beg/Int/Adv (ea) \$49.95
All Three Videos \$129.95



3 Easy Ways to Order:



CALL ▶ 1-800-748-4838
8 0 1 - 3 7 5 - 8 6 8 0
FAX ▶ 1-801-373-6872

MAIL ▶ K.L.S. Corporation
2181 Larsen Parkway
Provo, UT 84606

CIRCLE 782 ON READER SERVICE CARD

The Most Elaborate Interactive Movie Ever Created Will Blow You Away!



Three Big CDs! Almost 2 gigabytes of gaming fun! (Were this put on floppies it would take almost 1250 HD disks!)

■ Stars Hollywood actors Brian Keith, Margot Kidder, Russell Means, and the voice of James Earl Jones! ■ Features a virtual reality engine that will amaze you with its realism! ■ Unparalleled graphics and freedom of movement. ■ Features a rich original musical score, high quality digitized voices and sound effects making this Interactive Movie as aurally exciting as it is visually stunning! Call 1-800-800-4880 for details.

CIRCLE 777 ON READER SERVICE CARD

Quick and Easy Spanish™



Speak like a native!

NEW! Interactive multimedia program teaches Spanish using natural voice, video clips, color pictures and plenty of exercises. This award-winning product includes nearly 2,000 screen pages and is value-priced. 30-day money back guarantee. Don't wait, call today. Thank you.

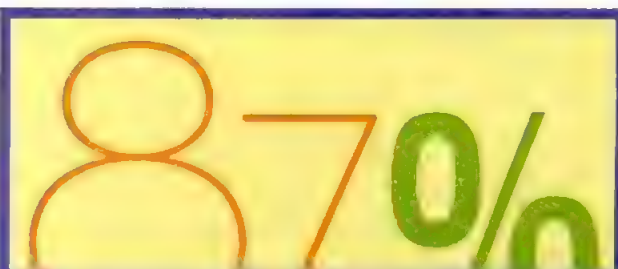


\$29.95
CD-ROM or Disk Version



To order, have your credit card ready and call 1-800-513-4111 24 hours a day
Other inquiries or outside U.S. call (714) 586-1284 M-F 9am-5pm p.s.t.
SoftBooks®, Inc., 22651 Lambert St., #101-A, Lake Forest, CA 92640

CIRCLE 778 ON READER SERVICE CARD



OF PC MAGAZINE SUBSCRIBERS WHO KNOW MARKETPLACE HAVE PURCHASED HARDWARE IN THE PAST 12 MONTHS OR WOULD CONSIDER DOING SO. AFTER SEEING AN AD IN THE SECTION SHOULDN'T YOU SEE YOUR AD HERE?
CALL 800-825-4237 TODAY!

Cakewalk home studio™



Turn On, Play In, Print Out.

With **Cakewalk Home Studio™**, making music on your PC has never been easier. Play along with MIDI files. Improve your musical skills.

Create and print original compositions. Even add voice or sound effects to your MIDI tracks for multimedia presentations.

- 256-track MIDI sequencer for Windows 3.1
- Works with sound cards and MIDI instruments
- Staff view, piano roll, faders, tempo map, more
- Prints up to 16 staves per page
- Fast drag-and-drop editing
- Plays back digital audio wave files
- Includes Wave editor and CanvasMan™ software

Only \$169!

To order, or for more information, call
800-234-1171 or 617-926-2480.

Demo pack \$5. Song file collections and drum patterns also available.

**Twelve
Tone
SYSTEMS**
P.O. Box 760, Watertown, MA 02272

CIRCLE 779 ON READER SERVICE CARD

**“PC Magazine
Marketplace
is the place
where buyers
look when they’re
ready to buy.”**



“Our own studies prove that PC Magazine pays for itself many times over. We’re getting higher quality leads that turn into sales. It produces for us. For leads and revenue generated, PC Magazine Marketplace is number one.”

**Mike Strand, President
StrandWare, Inc.
bar coding**

**Write your own PC Magazine testimonial and
put your ad here...Start advertising now!**

Call 800-825-4237 today.

Version 3.0

ORIGIN™

**TECHNICAL GRAPHICS • DATA ANALYSIS •
DATA ACQUISITION • WINDOWS**

ORIGIN is your complete laboratory data management solution, providing unrivaled flexibility, publication-quality technical graphing, and sophisticated data analysis capabilities in an easy-to-use Windows environment.

**For a Free Demo, Call
1-800-969-7720**

MicroCal Software, Inc., One Roundhouse Plaza, Northampton, MA 01061
Tel: 413-586-2013 • Fax: 413-585-0126

CIRCLE 780 ON READER SERVICE CARD

INTERNET FREE

The world's premier internet system is now online, offering you access to computers around the world.

ALWAYS FREE

BUSINESS & RECREATION

FREE E-MAIL, USENET, IRC

1-515-945-7000

CYBER LINK

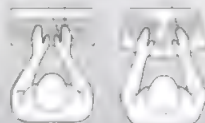
If your keyboard's straight, your wrists aren't.

Ordinary keyboards force you to bend your wrists at an unnatural angle.

But our **MiniErgo™** keyboard's gently sloping V-configuration — the result of extensive ergonomic research — keeps your hands and arms aligned. So you type more comfortably and help reduce the risk of RSI.

You'll get used to our standard QWERTY layout and full-sized keys — plus standard embedded or optional separate numeric keypad — fast.

And it's straight from Marquardt, respected manufacturer of premium switches and keyboard components since 1925.



Standard MiniErgo

Call or Fax us toll-free now.

\$179

1-800-427-ERG0
Ext. 1000 for FAX orders



CIRCLE 781 ON READER SERVICE CARD

PREMIER/WINDOWS

MUSIC/MIDI - SCIENTIFIC/ENG. - SERVICES/ON-LINE - INPUT DEVICES

OVERSTOCKED! MUST LIQUIDATE!

HARD DRIVES

MODEL	SIZE	SPEED	TYPE	PRICE
ST3290A	204MB	13MB	IDE 3.5"	\$218
ST3391A	340MB	13MB	IDE 3.5"	CALL
ST3491A	420MB	13MB	IDE 3.5"	CALL
ST3555A	540MB	13MB	IDE 3.5"	CALL
ST3600A	570MB	13MB	IDE 3.5"	\$479
ST3750A	710MB	13MB	IDE 3.5"	\$1,199
ST31200A	1020MB	13MB	IDE 3.5"	\$1,999

COMAR

MODEL	SIZE	SPEED	TYPE	PRICE
CA210A	210MB	13MB	IDE	\$198
CA230A	230MB	13MB	IDE	\$208
CA250A	250MB	13MB	IDE	\$218
CA270A	270MB	13MB	IDE	\$228
CA290A	290MB	13MB	IDE	\$238
CA310	310MB	13MB	IDE	\$248
CA330A/S	330MB	13MB	IDE	\$258

CD-ROM STORAGE SOLUTIONS

On-Line

Network Ready
CD-Rom Towers with
Corel Network
Manager Software



4 Bay **7 Bay** **14 Bay**
\$1,637 **\$2,746** **\$5,511**

SCSI Host Adapters:

Model	Bus	
AHA-1542CFK	ISA	\$299
AHA-1640K	MCA	\$381
AHA-2742TK	EISA	\$466

CD-Net for Dos 100 User \$1,295
(Optical Server Applications)

CD-Net for Netware 100 User \$1,295
250 User \$1,895

Near-On-Line Jukebox

Model	#Disk	#Drives	
Pioneer DRM-604X	6	1	\$1,295
Pioneer DRM-1804X	18	1	\$2,495
NSM CDR-100 XA	100	1	\$7995
Kubik CDR-240M	240	1	\$ CALL
Pioneer DRJ 5004X	500	4	\$18,750

CD-Rom Production Hardware

Pinnacle Micro RCD-202 Recorder	\$ 95
Yamaha CDR-100 Recorder	\$4,495
Fujitsu M3096G Scanner	\$4,995
Ricoh IS510 Scanner	\$12,450

Premastering Software

Incat Easy CD-PRO	\$1,995
Incat Easy CD-PRO MM	\$2,995

BOFFIN

L I M I T E D



612-894-0595
FAX: 612-894-6175

2500 W. COUNTY RD. 42 • SUITE #5 • BURNSVILLE, MN 55337

CIRCLE 559 ON READER SERVICE CARD

MEMORY factory outlet

Supplier to OEM's for 11 years

* Memory upgrades for over 1900 brands and models of PC's, laser printers, and workstations

* Lifetime warranty

* Recognized and recommended by OEM's (listed in the Toshiba Technical Information Guide as the least expensive manufacturer approved by Toshiba America)

Please check for current prices and brands/models not listed, but to let you compare, the following are samples of what our actual (not advertised) prices were on July 23, 1994:

APPLE PBOOK 100 2/4/6MB	\$89/\$153/\$209
APPLE POWERBOOK 140/170 4MB	\$161
APPLE POWERBOOK 210-270 4MB	\$162
AST ADVANTAGE NOTEBOOK 4MB	\$177
AST BRAVO/LC 486 16MB	\$599
AST POWEREXEC EL/325SL 4MB	\$146
AST POWEREXEC 425SL S/E4MB	\$146
AST W500/780-004 W/WHITE/RT 4MB	\$151
AST PREMIUM/LX 8MB	\$302
AST PREMIUM EXEC 4MB	\$177
AT&T STAR SERVER 486 16MB KIT	\$247
BROTHER HL-10H 8MB	\$358
CANON NOTEJET/486 4MB	\$190
COMMODORE AMIGA 3000 4MB	\$157
COMPAQ CONCERTO 4MB	\$182
COMPAQ CONTURA/486 4MB	\$174
COMPAQ LITE ELITE 4MB	\$182
COMPAQ LITE LITE/486 8MB	\$322
COMPAQ PROLINEA 486/CD5 4MB	\$172
COMPAQ SYSTEMPRO 8MB	\$332
DATAPRODUCTS LZR-2000N 4MB	\$218
DECpc 325SL NOTEBOOK 4MB	\$148
DECpc MT/MTE 16MB	\$652
DECpcXL SERVER 8MB	\$329
DELL OCTIPLEX 486 16MB	\$599
EPSON ACTION LASER 1500 2MB	\$108
EPSON ENDEAVOR 486C 8MB	\$327
EVEREX TEMPOLX 2MB	\$116
GRID CONVERTIBLE/2260 2MB	\$119
HP 95LX/100LX/OMNIBOOK 1MB	\$124
HP APOLLO/9000 735 16MB	\$763
HP NETSERVER LE/LF/LM 32MB	\$1453
HP VECTRA XP/80 8MB	\$332
HP DESKJET 500/520/560 256K	\$60
HP DESKJET 1200C/PS 4MB	\$157
HP DESIGNJET 850C 16MB	\$599
HP LASERJET 4/4M/4SMX 4MB	\$172
IBM AMBRA NC 425SL 4MB	\$186
IBM THINKPAD 350/386C 8MB	\$283
IBM THINKPAD 750/750C/750/700 4MB	\$200
IBM PS/VALUEPOINT 16MB	\$661
LEXMARK 4000/4075 4MB	\$157
NEC ULTRALITE VERSA 4MB	\$192
OKIDATA OKILASER CLAUDE 4MB	\$229
PANASONIC CF-270 2MB KIT	\$108
SHARP PC-4200/2200/40 1MB	\$49
SHARP PC-3000/3100 1MB SRAM	\$124
SHARP PC-7700/8600 16MB	\$748
SHARP JX-9500/9700 4MB	\$243
SUN SPARCSTATION SLC 4MB	\$171
Ti TRAVELMATE TM2000 1MB	\$49
Ti TRAVELMATE TM4000 4MB	\$194
TOSHIBA T1000/T1800/T2200 2MB	\$49
TOSHIBA T1200XE 2MB	\$79
TOSHIBA T1600 2MB	\$79
TOSHIBA T1900/T1910/T1950 4MB	\$196
TOSHIBA T3400/T3400CT 4MB	\$200
TOSHIBA T4800/T4700/T4600 16MB	\$745
TOSHIBA T5100 2MB	\$82
TANDY 1500/1500HD 1MB	\$80
TANDY 4800HD/4860HD 4MB	\$192
ZENITH ZN/OTTE/486 8MB	\$389
ZEOS POCKET PC 2MB	\$218
1MBx5-70 3-CHIP 1MB SIMM	\$39
4MBx5-70 9-CHIP 4MB SIMM	\$155
1MBx36-70 72-PIN 4MB SIMM	\$162
2MBx36-70 72-PIN 8MB SIMM	\$326
16MBx36-70 30-PIN 16MB SIMM	\$508

WE HAVE FAX/MODEMS AND SOME BATTERY PACKS TOO
CONTROL Memory Factory
"always insist on CONTROL"

1155 Chess Drive, #116
Foster City, CA 94404
Phone: (415) 578-1901
Fax: (415) 578-1914
1-800-952-7867

CIRCLE 584 ON READER SERVICE CARD

As Seen on TV Channel 9 News as Low Price Leader**IBM • TOSHIBA • ZENITH D.S. • EPSON • COMPAQ • PACKARD BELL
SHARP • AT&T • BONDWELL • AST • TEX. INST. • TWINHEAD & MORE****Largest Selection of Notebook Computers - 800-436-0552****Upgrade Your
286/386 to
486 - \$395**Notebooks/Laptops &
Desktop. We Upgrade & Ship
your Computer in 3 Days.
Call for Details!!!**Toshiba
Notebook****\$499**40MB Hard
Drive
Call for
Details!!!**Toshiba
Notebooks**

T1850 Mono 80/120	\$995/1095
T1850 Color 80/120	\$1295/1395
T1900 Mono 120/200	\$1199/1299
T1910 Mono 120/200	\$1299/1399
T1910CS 120/200	\$1699/1799
T1950 Mono 120/200	\$1499/1599
T1950CS 120/200	\$1699/1799
T1950CT 200/320	\$2199/2399
T3400 Mono 120/260	\$1399/1699
T3400CT 120/260	\$2799/2999
T4400SX 80/120	\$999/1099
T4400 SX Color 120/200	\$1799/1899
T4500 Mono 80/120	\$1099/1199
T4500 Color 120/200	\$1999/2199
T4600 Mono 120/200	\$1799/1899
T4600 Color 200/320	\$3699/3899
T4700CS 200/320	\$2999/3199
T4700CT 200/320	\$4199/4399
T4800CT 510 MB	\$5899
T6400 SX Mono 120	\$2399
T6400 DX Color 200	\$2799
T6400 MM/DX2/50 200MB	\$3599
T6600 C/CD	\$5699
T6600 C/CDV	\$6599

Some Models are "B" with 1 Year Warranty

IBM Notebook - \$699**486 4MB
80MB****\$699**

- ◆ Weighs 2.5 lbs.
- ◆ FaxModem - **FREE**
- ◆ Extra Battery (\$150) - **FREE**
- ◆ DOS 6.0 - Windows - **FREE**
- ◆ Pen Pointing Device - **FREE**
- ◆ 6" Display ◆ Double Spaced HDD
- ◆ Leather Case ◆ Ext. Floppy Drive
- ◆ IBM Built SubNotebook - Dauphin Model

Lowest Price 486 in the Nation!!!**Color Notebook****80MB - \$899**Call for
Details!!!**\$449 Palmtop**

- ◆ 2 - Type I PCMCIA slots
- ◆ 1MB RAM ◆ 1.5MB ROM
- ◆ DOS 5.0 ◆ MS Works
- ◆ Case ◆ 1.3 lbs.
- ◆ LCD ◆ Serial & Parallel Ports

Leather Carry Case

Features two individually padded compartments that measure 11" x 13" x 2". The computer compartment has an extra layer of shock absorbent foam padding. The second compartment is designed to fit power adapters, external drives, keyboards, portable printers or fax machines.

The case also features a detachable shoulder strap, holds disks pens, business cards, extra batteries, modems and accommodates a cellular phone.



Leather Portfolio \$19
In Denim \$29
In Leather \$39

IBM 486 - \$499One Year IBM
On Site Warranty

- ◆ 4MB RAM
- ◆ 3.5" 1.4MB Floppy
- ◆ SVGA Card
- ◆ DOS & Windows
- ◆ Mouse
- with 80MB HDD **\$599**
- 8MB RAM/240MB HDD **\$799**

**IBM 386SX - \$369**

- ◆ 2MB RAM ◆ I/O Card ◆ VGA Card ◆
- ◆ Floppy ◆ DOS ◆ 40MB Hard Drive ◆

286 Desktop - \$199

- ◆ 1MB RAM ◆ Floppy ◆ Keyboard ◆
- with 40MB HDD - \$299

**AST Multi Media
486-25**

- ◆ 120MB HDD ◆ 4MB RAM
- ◆ Double Speed CD ROM
- ◆ 16 Bit Sound Card
- ◆ Stereo Speakers
- ◆ 3.5" 1.44 Floppy
- ◆ SVGA Card
- ◆ Mouse
- ◆ 101 Keyboard
- ◆ MS DOS ◆ Windows 3.1

Monitors: VGA **\$99**
Color **\$199**

\$799**486 Notebook
\$999**

- ◆ 33Mhz ◆ 4MB RAM ◆ 120MB HDD
- ◆ Int. FaxModem ◆ Built in Trackball
- ◆ Math Coprocessor ◆ PCMCIA Slot
- ◆ Int. 3.5" 1.44MB Floppy ◆ 6 lbs.

**Compaq
Laptop****486 VGA - \$689****Grid Laptop**20MB Hard Drive
Call for Details!!!**\$349****386SX Laptop - \$599**

- ◆ HDD ◆ 2400 Modem ◆ Call for Details!!!

**Dollar
Computer
Corporation**

Policy: Prices and availability subject to change without notice. Above are cash prices only. Call for other forms of payment. We ship by U.P.S. FedEx, DHL, NO returns without RMA. 20% restocking charge on returned items. All sales final. Not responsible for compatibility. We check for stolen cards. Handling charge \$5.95. Not responsible for typing errors. All manufacturer warranties apply.

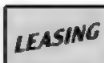
ORDERS ONLY - 800-436-0552

Fax Orders/Inquiries: 714-975-1560
Customer Service: 714-975-0873

18017 T Skypark Circle, #1002
Irvine, CA 92714

OPEN: 7 a.m. - 6 p.m. PST - Mon - Fri
9 a.m. - 3 p.m. - Sat

We Verify All Credit Cards



Low Cost Intel 486SX-25 MHz VLB \$675

- Mini-Tower Case, 32 Bit CPU
- 420 MB Fast Drive (15ms)
- Enhanced Keyboard
- Upgradable to DX2-66MHz
- 1.44 MB Floppy Drive
- 128k Write Back Cache
- 4 MB RAM, expands to 32 MB
- 2 Serial/Parallel
- 33MHz add \$20

MSE VL 486DX-33 MHz

- 80486DX-33 CPU, 4MB RAM
- 1.44MB Floppy Drive
- 340MB Fast Drive (12ms)
- 128k Cache
- Enhanced Keyboard
- 66MHz add \$100
- 100MHz add \$300

\$795**PCI 486 DX2-66 MHz**

- 8 MB Ram, 128 K Cache
- 1.0 GB SCSI II Hard Disk (9ms)
- PCI SCSI II W/16550 Port
- PCI AT1 SVGA 1 MB RAM
- 15" 1280 x 1024 28 Monitor
- 101 Key Keyboard

\$1895

With Review: 100% processor MS
Engineering MS-486DX-33MHz would
be a worthwhile investment for
processing intensive work

Motherboard Special

- 486SX-25MHz w/4MB RAM \$349
- 486-33MHz w/128k Cache/4MB RAM \$499
- 486-66MHz DX2 w/128k Cache/4MB RAM \$549
- 486-66MHz DX2 w/128k Cache/4MB RAM \$599
- 486 PCI-66MHz w/128k Cache/4MB RAM \$699
- 486 EISA-66MHz w/128k Cache/4MB RAM \$699
- Pentium-60MHz w/256k Cache/4MB RAM \$899
- Pentium-66MHz EISA/PCI w/4MB RAM \$1299
- Green-486-100MHz D4 VLB w/out CPU \$149
- Micronics 486 VLB motherboard w/out CPU \$299
- Intel Pentium motherboard w/out CPU \$399

Power PC I Pentium P5-60 MHz

- Mini-Tower Case, 64 Bit CPU
- 8MB RAM, 256k Cache
- 540 MB IDE Hard Drive
- 1.44MB Floppy Drive
- Enhanced 101 Keyboard
- Intel PCI Chip Set

SAME DAY SHIPPING**\$1495****MS ENGINEERING, INC.**

10601 S. De Anza Blvd., Suite 214, Cupertino, CA 95014
(408) 257-4249 FAX: (408) 257-4248
Sales Hours: Monday - Friday, 9:00 AM - 5:30 PM
Saturday: 10:00 AM - 3:00 PM - PST

CIRCLE 562 ON READER SERVICE CARD

Build Your Own PC

- Essential Information for Assembling Your Own PC
- Select Your Own Components
- Build Exactly the System You Need & Want

Step-by-Step instructions cover
Local Bus 486/Pentium technology.

Topics include:

- Design For Your Needs
- Component Selection
- Assembly
- BIOS Configuration
- Troubleshooting & More!

Complete Package

- VHS Tape
- Workbook
- Tool Kit
- Glossary

Learn the secrets
of the pros

\$99

plus shipping

Mhz VIDEO

Everything you need but the parts!

1-800-659-8070

CIRCLE 563 ON READER SERVICE CARD

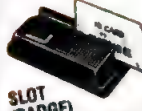
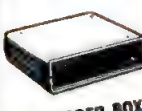
BAR CODE READERS

AMERICAN MICROSYSTEMS

2190 Regal Pkwy. • Euless, Texas 76040 • (817) 571-9015

FOR PC, XT, AT, PS/2 & TERMINALS:

- No software changes required
- Data appears as keyboard input
- Reads Code 39, I-2of5, UPC/EAN, Codabar, 11, 93, 128, MSI/Plessey
- Auto-discriminates between codes
- Accepts WAND, SLOT, MAG STRIPE, CCD, LASER
- Easy To Use

**MAG STRIPE****SLOT (BADGE)****WAND****DECODER BOX****LASER****CCD****METRO LASER****BAR CODE PRINTING SOFTWARE:**

- For Epson, OKI, IBM, Dot Matrix and HP LaserJet Printers
- Prints Code 39, I-2of5, UPC/EAN, Codabar, 128, 93, 11, MSI/Plessey

PORTABLE READERS:

- Use as a portable, wedge or terminal
- Input Devices: WAND, CCD, or 5V LASER
- Real-time clock for date and time stamps
- Automatic power off with resume
- "Built-in" inventory programs
- 54 key alpha/numeric keyboard
- Supports HAYES compatible modems

(800) 648-4452 • FAX: (817) 685-6232
30 Day Money Back Guarantee
One Year Warranty

100 MHz

- 486 SX-25 699
- 486 DX-40 799
- 486 SLC 2-66 839
- 486 DX 2-66 899
- 486 DX 4-100 1299
- Pentium 90 1849

- 420 Mb Hard Disk,
- 4 MB System RAM
- 32 Bit IDE I/O Controller
- 1.2 or 1.44 Floppy Drive
- Enhanced 101 Keyboard
- 2 serial, 1 Parallel, Game port

Network Cards • CD-ROMS • Hard Disks
Video Cards • Voice / Fax / Modem
Hard Disks • Tape Backup

Call For a complete Catalog & Price list
Prices subject to change w/o notice

AMERICOMP MICRO DISTRIBUTION
800-795-6288

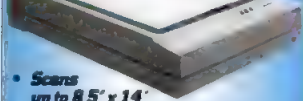
Phone: 301-861-5335 Fax: 301-616-3000
5550 Wilkins Ct, Rockville, Md 20852

CIRCLE 633 ON READER SERVICE CARD

YOUR FACTORY OUTLET

**600DPI, Color
Flatbed Scanner**

\$499



- Scans up to 8.5" x 14"
- NEW! • One-year warranty
- Interface card & imaging software
- TWAIN drivers included
- Scans 16 million colors, 256 greys, halftone or line art

JEM
Computer, Inc.

617-497-2500

CIRCLE 561 ON READER SERVICE CARD

ASSET2000 Asset Tracking System

- Reduces tie expended to receive, issue and physical count asset items
- Reduces the cost and frustration of tracing misplaced, lost or stolen assets

\$1,195**HARDWARE:**

- Scanners, Wands
- Decoders and Verifiers
- Portable and fixed data collection terminals
- Thermal transfer & direct printers
- PC's and related products
- Labels, Tickets, Tags, Badges

Bar Code Readers

- PC, AT, XT RS-232C, PS/2, IBM
- Laser, Wand, Slot Reader, Mag Stripe

from \$179

Symbol LT-1700 Scanner

- Laser Scanner
- PC Wedge
- Cables

\$559

CIRCLE 589 ON READER SERVICE CARD

Bar Code Printer

- Thermal Transfer
- Direct Thermal
- Label & Tag printing

from \$1,295

**SOFTWARE:**

- Label Generation
- Asset Management
- Inventory Control
- Access Control
- EDI
- Time & Attendance
- Labor Collection

Acatech

20301 Lake Forest Dr.
Suite 814
Lake Forest, CA 92630

Ph: (714) 830-6800

Fax: (714) 830-6882

BEST VALUE BARCODE

MORE FUNCTIONS MORE FLEXIBLE LOWEST PRICE

**(800) PC-CODES****Barcode Readers**

- Keyboard wedge readers for PC, Mac
- Wand, Laser, CCD, or Magstripe
- UPC, code 39, 128, EAN, JAN 2 of 5
- Complete w/steel wand \$295
- Complete w/laser \$995

Portable Readers

- Double duty as Non Portable
- Portable w/steel wand \$595
- Portable w/laser \$1,295

Bar code printing software from \$99
Direct From Manufacturer
5 Year Warranty

Advanced Barcode Technology

(516) 829-2135 Fax 829-0877
CIRCLE 570 ON READER SERVICE CARD

Bar Code Headquarters

Offices in
USA and
Europe

Labeling Software

For Dot Matrix or LaserJet

Windows
Version!

LABELS
B(C)E(X)I

- Any Format, Any Size Label
- WYSIWYG or Text Design
- Easy, Powerful

- Formats for Sears, K-Mart, Penney's, WalMart, TCIF, Logmars, AIAG, etc.
- Bar Codes: UCC-128, UPC/EAN, 2of5, MSI, 11, Codabar, Code 128, and Code 39
- Big Text and PCX Graphics too!
- Powerful, Versatile, Easy to Use
- Imports ASCII data files from dBase, etc.
- LabelRIGHT™ for Windows — \$295
- Above LabelPrinted by LabelRIGHT™ — \$279

Bar Code Fonts for Windows

- Insert bar codes into any font based Windows program via "Hot Key"
- UPC/EAN, 128, 2of5, Codabar, Code 39
- Fonts, Bitmaps and Metafiles — \$199

Cordless Bar Code Reader



- For IBM or Macintosh
- Keyboard or Serial Attach
- No Software Needed
- Wireless range up to 100'
- Optional Pocket Beeper
- No License Needed
- USA & Canada Approved
- Optional Pocket Beeper — \$395

- Base Station, Cable, and Wand — \$695

Portable Bar Code Readers

for PC, XT, AT, PS/2, Macintosh, and Serial Interface Computers

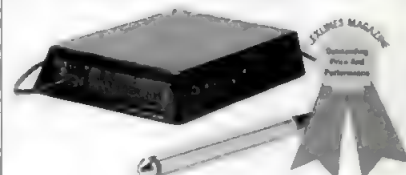
WITH
VOICE!

- Battery Operated Reader — 64K or 256K
- Kybd or Serial upload
- Display messages and optional Voice Messages tell Operator what to do. Messages are easily recorded (like answering machine) in any language.
- Wand, CCD or Laser Input
- UPC/EAN, 128, 2of5, MSI, Code 39, etc.
- Real Time Clock for date/time stamps
- Double duty as Non-portable Reader
- No Programming Necessary
- Portable label printer Support
- Very Easy to Program! Custom Prompts.
- 64K Unit with Wand & Voice — \$799
- 256K Unit with Wand and Voice — \$899



Bar Code Readers

for PC, XT, AT, PS/2, Mac and RS-232 Terminals



- Attaches as 2nd Keyboard
- UPC/EAN, Code 128, 2of5, MSI, Code 39
- Wand, Magstripe, CCD, Slot Badge or Laser
- All European Keyboards Supported
- Superior Read Rates. Made in USA.
- Top Rated by Independent Reviews
- Complete with Laser Scanner — \$1250
- Complete with CCD Scanner — \$624
- Complete Wand only Reader — \$329

Ordering is Easy!

Call for
our Free
Catalog

- Made in the USA
- Free "800" Support
- Qualified P.O.'s Accepted
- 2 Year Warranty on Readers
- Same Day Shipping
- Free UPS Blue in US
- 30 Day Money Back Guarantee

European Office: (353) 1 6614 566
In US or Canada Call Toll Free

800-345-4220

Worthington Data Solutions
3004 Mission Street • Santa Cruz, CA 95060
Phone: 408-458-9338 • Fax: 408-458-9364

WORTHINGTON
DATA SOLUTIONS

ITS

Your One Stop Source for Bar Code Solutions

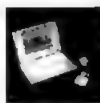
Quality • Performance • Value

ITS

Low Cost Software Reader

NEW!

- Eliminate external box with decoding software.
- No power supply needed for notebook/ laptop.
- Windows, RS-232 and PC Wedge Version.
- Applications include: Field Sales/Order entry and inventory, document tracking and shipping and receiving.



Select the Scanner You Need

- All types, configurations, sizes.
- Largest selection of Hewlett-Packard wands available.
- Lasers, CCD, slot, wand
- and POS/Retail Table-Top scanners.
- HP wands with built-in decoders.

NEW!



Easy-to-Use Labeling Software

- For all dot matrix, laser, and bar code printers.
- Available for Windows and easy to use.
- Suppliers of Zebra and Sato bar code printers.



NEW!

Low Cost, High Performance, Compact Magnetic Stripe Readers

- Versatile: Tracks 1, 2, 3.
- Bi-directional and durable.
- Excellent for retail and industrial usage.
- RS232 and PC Wedge versions and encoders.

Value Packed Portable Terminals

NEW!

- Easy to upload data and to program.
- MS-DOS compatible terminal available.
- Multi-memory options, battery backup.
- Applications include: Inventory Control and Retail/point of sale.
- Programmable as a printer driver.



- Bar Code Readers for IBM Compatibles, Mac, RS-232, Network Industrial Terminals, DEC, WYSE, IBM, HP, and other Hard-to-Find Interfaces
- Plug and play. • Easy Setup.
- No software needed.
- Multi-input versions available.

Call Ahead Our 30 Day Money Back Guarantee! Variety of Payment Options! Toll Free Technical Support! Next Day Delivery! • Over 100,000 Satisfied Users! Technical Support! Full 2 Year Warranty on Readers and Wands!

International Technologies & Systems

9201 Forest Hill Avenue, Suite 108, Richmond, VA 23235 • 655K No. Berry St., Brea, CA 92621
CALL US! Eastern USA (800) 826-1688 • Western USA (800) 228-9487
International Call (714) 990-1880 • FAX (714) 990-2503

CIRCLE 564 ON READER SERVICE CARD

PORTABLE™ PRODUCTS

YOUR COMPLETE SOURCE FOR BAR CODE AND HANDHELD DATA COLLECTION SYSTEMS

- BARCODE READERS — Keyboard wedge, RS-232, PC, Mac, Most data terminal interfaces
- INPUT DEVICES — Laser, CCD, Wand, Slot, Magstripe — All available with built-in decoder
- PORTABLE HANDHELD READERS — DOS & Windows Application Generators — No programming experience needed. Develop your Application in minutes
- Printers, Verifiers, Label Software, Labels, Custom Cases, Custom Software Development, Systems Integration, Complete Systems

FREE UNLIMITED 800 TECH SUPPORT
UNCONDITIONAL SATISFACTION GUARANTEE
CALL FOR FREE CATALOG
1-800-849-0958

PORTABLE™
PRODUCTS

A Division Of International Systems Group, Inc.
8401 K Mayland Drive • Richmond, VA 23294
phone: 804 146-0111 • fax: 804 146-0196

CIRCLE 565 ON READER SERVICE CARD

BARCODE

MAGNETIC STRIPE SYSTEMS

12140 Severn Way, Riverside, CA 92503

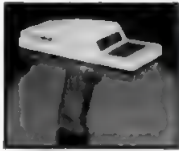


\$249
Hewlett Packard
Stainless Steel Wand with
decoder. FREE WAND HOLDER.

PORTABLES with data
collection or RF capability
64K-4.2Mb

P.O.S. software, cash draw-
ers, receipt printers, pole
displays, programmable
keyboards

**INVENTORY, TOOL,
PICK, ASSETS, REC.V,
TIME and ATTEND...**
application software



RF Terminals

**MAGNETIC STRIPE
READ/WRITE SYSTEMS**
for tracks 1,2 and 3 - \$1099

SOFTWARE WEDGE
(DOS/WIN) with HP steel
wand or laser

PRINT SOFTWARE
(DOS/WIN/UNIX...)

FREE Bar Code Printing
Software with any purchase
\$149 Retail



SYMBOL LS2000
Laser Scanner with
decoder. FREE LASER STAND.

800/653-4252 USA
800/219-5178 CANADA
909/270-0016 INTL
909/270-0920 FAX
30-Day Money Back Guarantee*
1-5 Yr Warranty • MADE IN THE
USA • Same Day Shipping
FREE UPS Ground

FREE Bar Code Printing
Software with any purchase
\$149 Retail

CIRCLE 572 ON READER SERVICE CARD

BAR CODE LABELING, PRINTING & READERS

PRINTBAR™ BAR CODE PRINTING

New Version!

BEAR ROCK BAR CODE LABELER™ for Windows

- ▶ Design labels with bar codes, text & graphics.
- ▶ Choose from over 450 popular label formats, or design your own.
- ▶ Print all popular bar code symbologies.

- ▶ PrintBar. Precision bar code fonts for Windows, OS/2 or Macintosh.
- ▶ PrintBar II. Bar code printing program for DOS.

CODESCAN 3000™ BAR CODE READER

- ▶ Compatible with PC, PS/2, Macintosh or serial terminals
- ▶ Comes with wand and 5 year decoder warranty.
- ▶ Laser gun, CCD, badge slot, magstripe options.

Money Back Guarantee
Bundle Discounts
800 232-7625

Bear Rock
TECHNOLOGIES

4140 Mother Lode Dr., Ste. 100,
Shingle Springs, CA 95682
916 672-0244 • Fax 916 672-1103

MaxiLAN: LAN-Ready Data Collection PC

NEW!
SPREAD SPECTRUM
MODEM AVAILABLE.



- MaxiLAN packs the power of a 386SX PC with on-board Ethernet and two PCMCIA slots in a compact 9.5 x 6 inch package.
- Two bar code ports, two serial and one parallel port, plus external keyboard.
- 4 x 40 backlit LCD display.
- Can be mounted on counter top or wall.
- Features local solid state hard drive.
- DOS 6.0 and Novell drivers pre-loaded: type NET and you're connected to a NetWare server.
- Drivers for TCP/IP, LANtastic and LAN Manager included.
- Unlimited telephone technical support.



"MaxiLAN
installation is a
cinch. We got
the product up
and running in
under a minute."
"August '89"



It runs with
NetWare
(Developer tested only. Novell
endorses no hardware and
warranty for the product.)



To receive more information please contact UBI at:
(301) 210-3000 or fax: (301) 210-5498

CIRCLE 508 ON READER SERVICE CARD

THE BARCODE LEADER DOES IT AGAIN...

KEYBOARD WEDGE SOLUTIONS!

HAND-HELD LASER GUN

FREE
BARCODE
PRINTING/CREATION
SOFTWARE
WITH LASER PURCHASE

\$895

STAINLESS STEEL WAND **\$279**

800 TECHNICAL SUPPORT
30 DAY MONEY BACK GUARANTEE
SAME DAY SHIPPING
2 YR LASER SCANNER WARRANTY

DATAVISION
30 INDIAN DR. JYLLAND, PA 18974
TEL: 717/247-0000 FAX: 717/247-0001

1-800-486-0620
EAST COAST

1-800-486-9585
WEST COAST

CIRCLE 507 ON READER SERVICE CARD

WORLD'S LEADING Barcode Re-marketer

**Hand-Held
Laser & Wedge**
\$489

**Wand &
Wedge**
\$199

- 800 Technical Support
- 30 Day \$ Back Guarantee
- Same Day Shipping
- 2 Year Warranty

RYZEX
RE-MARKETING

800-264-6764

Offices USA / Canada Tel: 604-599-8570 Fax: 604-599-8940

Call for even Better Deals on Used/Surplus Equipment

CIRCLE 566 ON READER SERVICE CARD

RETAIL STORE POINT OF SALE

Need Inventory Control??

For all retail stores. Has quick
invoicing, on line stock search and
browse, sales analysis, stock order
listings, and inventory updating
\$289 - \$489

Cash drawers, tape receipt
printers, barcode scanners
Accts Receivables, Mailing
List program, Barcode
programs, General Ledger,
Accounts Payables

Inventory Programs for labs,
supply rooms, dental offices,
Hospitals, Auto Parts, Tire
Dealers, and wholesalers
Free technical support

800-426-6598

Freeman Software
334 Fieldside - Garland, TX 75043

CIRCLE 573 ON READER SERVICE CARD

BAR CODE EXPERT

HP steel wand with
Keyboard wedge reader
\$219

3" CCD with built-in
Keyboard wedge reader
\$329

Portable data collector
• 128K RAM (expand to 256K)
• Built-in program generator
• Uploads data directly to
your application software
• Can be used as a
terminal reader
\$599

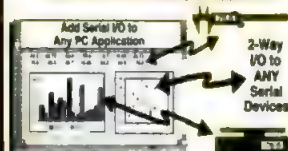
- Keyboard wedge reader for PC/XT/AT, PS/2, MAC, Terminals. No software change
- Reader with RS-232, RS-485, DTMF output and multidrop protocol
- Direct from manufacturer 30 day money back guarantee. Please call for free catalog.
- Dealer and distributor's discount available

800-765-2271

IBS-Intelligent Barcode Systems
16031 Kaplan Ave., City of Industry, CA 91744
Tel (818)968-6265 • Fax (818)968-5527

RS232 Direct Into Any PC Program

Read Real-Time Serial Data Into Lotus Excel, Quattro Pro etc... any PC application



- ✓ SoftwareWedge™ adds serial I/O to any PC app.
- ✓ RS232 data appears in any program as if typed in!
- ✓ Eliminate manual data entry or custom programming.
- ✓ Advanced features allow full customization of all input.
- ✓ Fully supports COM in Windows, OS/2 or NT.
- ✓ Now with **Free** RS232 Debug/Diagnostic software.

No Special Hardware or Programming Required!

SoftwareWedge™

NEW! Dos ver. Only \$159, Windows \$199

NEW Pro Vers. Now Avail.

Call For Free Info

TAL 800 722 6004

T.A.I. Enterprises, 2022 Wallace St., Philadelphia PA 19130. (215) 763-5820 Fax: (215) 763-9711

Windows™ version **PROFESSIONAL BAR CODER™**
210.496.5109

AIPro™ SOFTWARE & FONT PACKAGE

Create Bar Codes Like a Pro.

- ◆ automatically encodes.
- ◆ calculates checksums.
- ◆ encodes data base fields.
- ◆ paste to most any program: Word™, WordPerfect™, CorelDraw™, PageMaker™.

Code 3 of 9 & UPC versions

Signatures \$39/Logos Quote only

RIVER CITY GRAFIX \$165

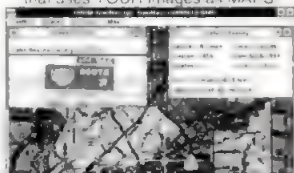
CIRCLE 576 ON READER SERVICE CARD

GPS 4U!

Wouldn't it be nice if your GPS moving-map used Windows .BMP maps?

>> IT CAN: Get AutoNav! <<<

It's a NAVSTAR GPS MAP package that uses YOUR images as MAPS!



AutoNav includes:

- Runtime logging
- Text/Image advisories
- Overlapping maps
- Full function Replay
- Speed-sensitive display
- Map calibration

Fully integrated Turnkey Briefcase systems available

\$165 from MANNING NAVCOMP

(214) 748-8275 24/7

CIRCLE 579 ON READER SERVICE CARD

AutoData PRO II

Desktop Forms Processing Software for Windows 3.1

AutoData PRO II automates and simplifies the data collection process. Forms are read and the data is exported to your file format. A variety of desktop scanners are available.

HAND-PRINTED - reads name, address, date, phone numbers, etc.

BAR CODE - reads product numbers, inventory codes, form IDs, etc.

OCR - reads preprinted job codes, order numbers, form IDs, etc.

CHECK MARK - reads multiple choice, rating, true/false, etc.

AUTO DATA SYSTEMS A Windows 3.1 DLL is Available for Developers

AutoData Systems

10385 W. 70th Street • Eden Prairie, MN 55344

Phone: 612/941-8180 • FAX: 612/941-7312

Toll Free: 800/662-2192

CIRCLE 578 ON READER SERVICE CARD

5-Year Bar Code Printer Warranty!

Label Printing Kits
WYSIWYG Label Software
Free Loaner Printers
800 Tech Support
In-Stock Labels & Ribbons

One Stop Bar Code Solutions

- **Wedge Readers**
Keyboard and Terminal Wedges for PC, XT, AT, PS/2, Mac, RS232/Terminals. Advanced data formatting. Decodes all major bar codes, supports multiple scanning devices. New!!! Software Decoder for Laptops/Notebooks.
- **Portable Readers**
DOS compatible, 2-16 line display, 64K-2 Meg memory, multiple keypad options. Resident or DOS/Windows programming. Optional integrated portable/laser.
- **Scanners**
Wand, CCD, laser, slot scanners, and magnetic stripe readers. New!!! Memory Button Technology.

Satisfaction Guaranteed!

1-800-805-0084

DATAGRAPHICS, INC.

Bar Code & Label Printing Systems

18540 E. Boundary Rd. Midlothian, VA 23112

PH: 804 763-2997 FAX: 804 763-4717

CIRCLE 535 ON READER SERVICE CARD

The Mail Order Wizard

Everything you need to manage your growing phone-order or mail-order business.

- Order processing
- Mail list management
- Electronic charge processing
- Inventory control
- UPS manifest
- Financial reporting
- Ad forecasting

Winner of **Home Office Computing's General Excellence Award**

Systems start at \$695
Call for free info or \$20 demo.

The Haven Corporation
1227 Dodge Ave., Suite M93
Evanston, IL 60202-1008
800-676-0098 or 708-869-3553

CIRCLE 581 ON READER SERVICE CARD

Voice Mail Cash Machine



Make thousands of dollars effortlessly by installing our voicemail in your 286/386. Use it to answer your home office phone, rent pocket-pagers, advertise products or operate a pay-per-call service using credit cards, passwords or a 900#. Systems start at \$295.

Call 24 hours: **800.283.4759**
Int'l & Demo line: 818.712.9560

DemoSource™
The Voice Application Superstore
8345 Reseda Blvd, Ste 202
Northridge, CA 91324 USA

CIRCLE 580 ON READER SERVICE CARD

"We convert more than **85% of inbound customer calls from PC Magazine Premier.**"

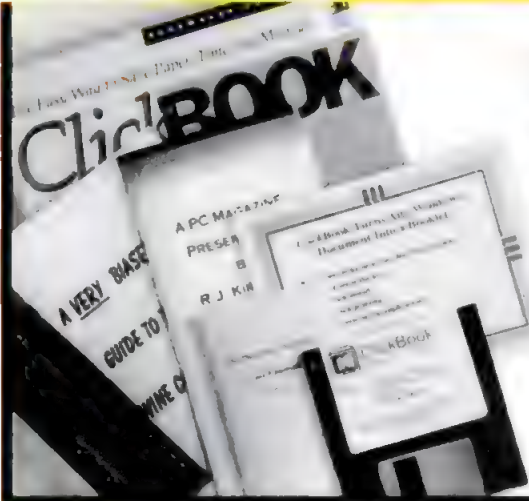
"Of the five publications we advertise in, PC Magazine Premier ranks right at the top. We get the best return on our ad dollars"

Pierre A. Narath, President
Unicore Software Inc.

Write your own PC Magazine testimonial and put your ad here...Start advertising now!

Call 800-825-4237 today!

To turn ANY Windows document into a handy booklet, just click, staple, and go!



Turn a 24 page report into a 6 page booklet. Transform pages of addresses into a pocket sized directory. Print manuals, programs, cookbooks, and more. **ClickBook™** makes it a snap!

Just click and **ClickBook** lets you select one of 18 styles, then it sets it all up, and even shows you how to print and staple.

ClickBook saves time, money, and paper. And it makes your Windows documents a pleasure to read.

The experts are raving about **ClickBook.**

"The most useful utility I've seen in months. It turns virtually any document created by a Windows application into a neat little booklet."

- Jim Seymour, PCWEEK, 8/9/93

"For saving paper and making virtually any kind of document easy to handle, **ClickBook** is a great utility that's stunningly easy to use."

- PC Magazine 11/23/93

Make your documents look like a million for just

Call 1-800-766-8531 to order **ClickBook** or (415) 617-1101 to find out more.

\$69.95

CIRCLE 577 ON READER SERVICE CARD

RFFlow

Professional Flowcharting
For Microsoft® Windows

SYSTEM DESIGN
DATA FLOW
ORGANIZATION CHART
STRUCTURE CHART

Create professional, fine quality charts quickly and easily. Call for free trial disk: (303) 663-5767 FAX (303) 662-4989

\$129.00 **RFF ELECTRONICS**

CIRCLE 634 ON READER SERVICE CARD

Trans-Ameritech

Life is too short to compute on anything else!®

Presents:
UNIX on CD-ROM

- Software Distribution
- BSD Distribution
- X Windows
- Applications
- All Sources are included!
- Install directly from CD-ROM
- TCP/IP, NFS, Development Environments

Price: \$39.95

Russian Games

- NEW! First time on US market!
- Great collection of Russian games, developed by Nikita Ltd
- 16 Games on one CD-ROM!
- VGA Resolution
- Sound Blaster Compatible
- For all ages: 7 - 99 !!!

Price: \$39.95

Tel. (408) 727-3883
FAX (408) 727-3882

CIRCLE 583 ON READER SERVICE CARD

Voicemail

SOFTWARE KIT

- Fax On Demand
- Call Processing
- 900# Compatible
- Remote Data Entry
- Supports 64 Lines

LaserVoice 2000 comes ready to install in your PC. It's easy and simple to install. Feature rich and state of the art technology makes LaserVoice 2000 the obvious choice. From \$1495.

HEAR THE DIFFERENCE! CALL TODAY!
216-253-8787

Free technical support ☎
AMERIFAX 572 W. Market St., #5
Akron, OH 44303

CIRCLE 585 ON READER SERVICE CARD

B.S. & M.S.

In Computer Science

- ALL COURSES HOME STUDY
- Approved for tuition reimbursement by leading corporations
- Increase your earning power
- Join students from leading computer companies
- Ada and C++ courses available

FOR FREE INFORMATION CALL 1-800-767-AICS or 1-205-323-6191

AMERICAN INSTITUTE FOR COMPUTER SCIENCES
The leading edge of learning

REMOVE HARDWARE LOCKS

Maintain Productivity!

Software utility that allows for the removal of hardware locks
Easy-Simple-Guaranteed

These and others are available:

MaxRoute	\$250.00
Pads PCB	\$99.00
CadKey	\$99.00
MasterCam	\$250.00
Tango PCB II	\$99.00
MicroStation	\$99.00
PCAD	\$250.00

Visa and Mastercard Welcome
Call or Fax for more information

SAFE SOFT SYSTEMS INC.
201-1111 MUNROE AVE.
WINNIPEG, MB
CANADA R2K 3Z5

PH (204) 669-4639
FAX (204) 668-3566

CIRCLE 582 ON READER SERVICE CARD

CD-ROMs

800-409-0617

100'S OF TITLES IN STOCK
MANY FOR \$10 AND LESS!

- Games
- Children
- Space
- Maps
- Hobbies
- Entertainment
- Health
- Nature
- Reference
- Education
- Business
- Sounds
- Technical
- DTP
- Pictures & Animation

JD EXPRESS
For Your CD-Roms
336 DICKENSBOROUGH AVE. - BOHEMA, NY 11716

CALL OR FAX FOR OUR LISTINGS
ORDERS 800-409-0617 We Accept
PHONE 516-563-0617 M/C Visa
FAX 516-563-0618 Discover Card

CD-ROMs

Free Catalog

Best Prices on CD's

7th Guest (2 Discs) M/M	28
9-digit Zip Cod e1994	21
Adventures In Heaven 2 (DOS/WIN)	19
Clipart Heaven 2 W/500pg Catalog	39
Encarta 1994 (MPC)	69
F-15 Strike Eagle III	25
Family Doctor 3rd Edition (MPC)	18
Grolier's M/M Encyclopedia (MPC)	39
Just Grandma & Me (MPC)	20
Linux Quarterly 94	25
Mad Dog McCree II M/M	39
Megarace (MPC)	29
Microsoft Bookshelf 1994 (MPC)	59
Night Owl V13	29
PC Library	25
Rebel Assault	49
Return To Zork	22
Shareware Heaven 3	29

Write or Call:
MOST SIGNIFICANT BITS
15508 Madison Avenue
Lakewood, Ohio 44107
(800) 755-4619

CIRCLE 584 ON READER SERVICE CARD

New Version

Use your PC to Master Japanese and Chinese

Enjoy mastery of Asian languages with *Smart Characters for Students™* word processing, reading, writing, translating, and learning tool for PCs. Handy on-line references, dictionaries, *furigana* and *English gloss annotations* speed reading, writing, and translation. Learn and use *kanji* and *hanzi* rapidly and effectively while creating your own letters, faxes, and vocabulary lessons. Version 2.9 is both DOS and Windows compatible. Just \$99.95 in stores or directly from us. Call or write for a free brochure.

知字

Apropos Customer Service 800-676-4021
8 Belknap Street, Arlington, Massachusetts 02174

Home Study

ACCREDITED B.S. DEGREE

in
Computer Science

Easy-to-study lessons written by the Grantham staff, and supplied to students along with software and instructional assistance—personal help by mail, phone, fax, BBS, whatever is appropriate in each case.

Professional software, no additional charge. Our emphasis is on teaching you computer science and guiding you to professional competence as well as your B.S. degree. Our degrees are accredited by the Distance Education and Training Council, Washington, DC.

Free Catalog: 1 (800) 955-2527

GRANTHAM College of Engineering
Grantham College Rd., Slidell, LA 70469-5700

Gamma UniType™

Localization Kit for Windows

Type foreign languages in your favorite Windows applications as easily as you type English!

European, Cyrillic, Asian, Middle Eastern, Indian, Biblical & more – scalable fonts for all the world's languages. Call the Win Language™ experts!

From \$99.95. Here's our guarantee: If you are not comfortably using your language of choice within 30 days, return the product for a full refund.

Gamma Productions, Inc.
12625 High Bluff Drive #218, San Diego, CA 92130
Sales: 800-97-GAMMA Tel: 619-794-6399 Fax: 619-794-7294

Ask about our Expert Translation Service and Products!

CIRCLE 586 ON READER SERVICE CARD

IMAGERS



OVERNIGHT
\$4.95
Slides & Canons
POSTSCRIPT

Digital Output & Production Center

- Slides/Overheads
- Dye-Sub Output
- Large Color Posters
- Canon Flery Lasers
- Slide Duplication
- 4x5 Neg/Pos/B&W



Photo CD
Scan \$.90
(800) 232-5411
22-7th St. • Allentown, PA 18106 • 484-972-0553

CIRCLE 587 ON READER SERVICE CARD

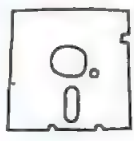


Virusafe™
The most advanced
anti-virus protection system.



PCRESC-U™
Improved back-up system that comes to
the rescue of your crashed disk.

- 30 Day Money Back Guaranteed!
- Accepting All Major Credit Cards



EliaShim
microcomputers, inc.

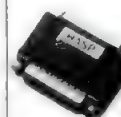
Phone: 1-800-477-5177
4005 Wedgemere Drive, Tampa FL 33610
Phone: (813) 744-5177
Fax: (813) 744-5197

CIRCLE 589 ON READER SERVICE CARD

Dongles? Buttons? Plugs?

Get Serious.

When it comes to software protection,
you need solutions - not gadgets.
You need **HASP** - the Professional
Software Protection System.



Easy to Implement
Interfaces are available
for most languages and
a variety of installation

options are supplied to meet your
needs and schedule.

Technology That's Tough to Beat
ASIC technology, sophisticated software
and random encryption algorithms
are just a few reasons your products
are safer protected by HASP.

Developed with Users in Mind
Transparency. Compatibility.
Connectivity. HASP was developed to
perform unnoticed. Whether installed
on a PC, Mac or network, your end-
users will never know it's there.

Get Serious - Try It For Yourself

Find out why HASP is
the fastest growing form
of software protection in
the industry.
Order your
HASP evaluation
package today.



1-800-223-4277

ALADDIN
SOFTWARE SECURITY INC.

The Professional's Choice

The Empire State Building
350 Fifth Avenue, Suite 7204
New York, NY 10118, USA
Tel: 212-564-5678
Fax: 212-564-3377

Offices & Distributors Worldwide

© 1994 Aladdin Software Security, Inc.

CIRCLE 590 ON READER SERVICE CARD

A chain is as strong as its weakest link.

New!
CD-Crypt
for secure
CD-ROM
distribution

**Support for
Windows NT**

Picture your Hardlock™ key as a bike lock,
and the accompanying software routines
used to implement the copy protection
as the chain. You can own the best lock
that money can buy, but that lock is
useless if the chain is weak.

Introducing **HL-Crypt**, a major break-
through in copy protection. HL-Crypt
is not just a shell or simple conditional
response checker. Using our pro-
prietary Patcher Technology, HL-Crypt
encrypts and binds the application to
your Hardlock™ device. HL-Crypt
features many protection modules
that secure the application against
piracy, reverse engineering, and
debugging, to name a few.

Picture HL-Crypt as an ironclad
chain. The only ironclad chain in
the industry today.
For more information, call
1-800-562-2543

HL-Crypt

**The Fortified Protection Linker
for Hardlock**



GLENCO
ENGINEERING INC.
SERVING THE SOFTWARE INDUSTRY SINCE 1979

270 Lexington Drive
Buffalo Grove, IL 60089-6930
Phone 708/808-0300
Fax 708/808-0313

Contact us for the name of the distributor in your country.



GLENCO
ENGINEERING INC.
Buffalo Grove, Illinois, USA
Printer

The only product that combines
fortified software encryption with
the Hardlock™ family of copy
protection devices for software
and network implementations.
Made in the U.S.A.

CIRCLE 588 ON READER SERVICE CARD

Software Protection from the Leader



Sentinel

The Worldwide Standard

More developers rely on Sentinel®, from Rainbow, than any other software protection in the world.

Only Sentinel gives you advanced protection for any platform. And every Sentinel meets the industry's most stringent quality standards.

Rainbow supports you with the industry's largest technical support staff. And once installed, Sentinel is truly transparent to your end-users.

So, when your software deserves the best protection, protect it with Sentinel. Protect it with confidence.

Only Sentinel Delivers:

- The Most Advanced Protection
- Protection For Any Platform
- Highest Quality & Reliability
- True Transparency For End Users
- Support From The Industry Leader

Order Your Sentinel Developer's Kit Today!

Used By Over 11,000 Developers

Quick & Easy To Implement

5 Million In Use Worldwide



SENTINEL
Securing the future of software

Call 800/843-0413

Tel 704/523-9500 • Fax 704/523-7651

RAINBOW

Offices & distributors located worldwide.

©1994 Rainbow Technologies, Inc. Sentinel is a trademark of Rainbow Tech.

CIRCLE 591 ON READER SERVICE CARD



Software

EVERLOCK

Az-Tech Software, Inc.

LEADERS IN SOFTWARE SECURITY

201 East Franklin, Suite 11

Richmond, MO 64085

(816) 776-2700 FAX (816) 776-8398

SAFEGUARD YOUR PROGRAMMING INVESTMENT PROTECT YOUR SOFTWARE TODAY

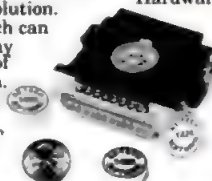
A great deal of time and effort has gone into building your new product and you have decided to protect against Software Piracy and Illegal Distribution.

Now you must choose between a **Software** or **Hardware** solution.

As your partner in the fight against Software Piracy, Az-Tech can help you make the right choice. We are the only company that offers you Compatibility, Ease of Use and Degree of Protection in both a Software and a Hardware Solution.

Az-Tech's security experts will help you to understand
DATE & EXECUTION LIMITS - COMPRESSION - ENCRYPTION - SERIALIZATION - REMOTE RESET
and much more. Don't reinvent the wheel!

Hardware



Call Today For A Free Demo

(800) 227-0644

EVERKEY

Ask us about our NEW Trial Packages and start protecting your Programming Investment TODAY !!!

CIRCLE 592 ON READER SERVICE CARD

Key-Lok™ Security

- ☐ Fighting piracy since 1982.
- ☐ Algorithmic response
- ☐ Programmable memory
- ☐ Very economical
- ☐ Device transparent to PARALLEL/SERIAL port
- ☐ Multiple security layers
- ☐ Counters/Real-time clock
- ☐ Multiproduct licensing
- ☐ DOS/UNIX/VMS/etc

Access Control System

Diskette Drive Locks

Microcomputer Applications

3167 E. Otero Circle

Littleton, CO 80122

(303) 770-1917

CIRCLE 593 ON READER SERVICE CARD

See us at
Comdex
Fall 1994!
Sands 4645

Ontrack DATA RECOVERY



- **PROFESSIONAL SERVICE** - AUTHORIZED by Conner, Iomega, Maxtor, Micropolis, Quantum, Rodime, Seagate, Western Digital, & others.
- **EXPERTISE** in DOS, Novell, OS/2, Macintosh, Unix, Xenix, Banyan Vines, Sun, DEC, & Wang. Service also available on tape & removable media.
- **ON-SITE**, weekend, & priority service backed by 24-hour worldwide support.
- **FOR FAST, SUCCESSFUL RESULTS** call Ontrack, we can recover your data!

MN: 1-800-872-2599 • CA: 1-800-752-7557

UK: + 44 81 974 5522 • Germany: 0130 815 198 • France: 05 90 72 42

6321 Bury Drive, Eden Prairie, MN 55346 • 2400 Main Street, Suite 200, Irvine, CA 92714

CIRCLE 595 ON READER SERVICE CARD

DATA CONVERSION

DISKS • TAPES • CARTRIDGES

CONVERSION-DUPLICATION-SCANNING

MORE FORMATS THAN ANYONE!

Quick • Reliable • Quality

WORD PROCESSORS, MINIS
MICROS, SPREADSHEETS
DATABASES, MAIL LISTS

IBM, DEC, APPLE, WANG
HP, WordPerfect, MS-Word



Lotus
Dbase
MICOM



LANIER

CPT, NBI

DISPLAYWRITER

8/4MM, XEROX, CP/M, UNIX ...

NATIONAL DATA CONVERSION

5 East 16th Street, New York, NY 10003

(212) 463-7511

AMERICA'S LEADERS IN DATA CONVERSION

CIRCLE 594 ON READER SERVICE CARD

Data Crash! We're Going In!



CPR & RS Data Recovery Service

**DOS, OS/2, Mac, Sun,
Novell, Unix, Mac Experts!**
Syquest, Bernoulli, Tape
Optical Service

CPR 3.0

Data Recovery Software
Computer Peripheral Repair &
Recovery Services Inc

11440 Okeechobee Rd Suite 200

Royal Palm Beach, FL 33411

800-765-9292

CIRCLE 596 ON READER SERVICE CARD

DATA CONVERSION

If you want the most complete conversion services in the industry, just call...



(800) CONVERT

Capabilities include over 5000 formats

**PIVAR
COMPUTING SERVICES, Inc.®**

165 Arlington Heights Rd #M

Buffalo Grove, IL 60089

(708) 459-6010

The Fastest Turnaround! ★ ★ ★ High Quality Media!

DISKETTE DUPLICATION
Count on our Reliable, Worry-Free Service!

SOFTWARE PACKAGING SUPPLIES & FULFILLMENT
Printed Sleeves, Labels, Vinyl Pages, Mailers, License Agreements, Shrink Wrapping, Mailing, etc.

CD-ROM MASTERING & DUPLICATION
One-off CD, Small and Large Volume duplication and Packaging.

MEDIA CONVERSIONS
2500 Word Processing Formats, Disks, 9-Tracks, 3480, Colorado, QIC-80, 8mm, Imm DAT, TK50, OCR Scanning

BLANK DISKS/CD-ROM's
Will beat any advertised price!

COMPANY COMPENDIA Inc.
1-800-374-DISK
Ph: 312-419-8771 Fax: 312-419-1390

CIRCLE 596 ON READER SERVICE CARD

CALL THE "MEGA-SOURCE"!!

SOFTWARE PRODUCTION

Call Us First...

- ✓ Disks & Tapes
- ✓ Design & Printing Services
- ✓ Package Assembly
- ✓ Fulfillment
- ✓ In-Bound Tele-Sales
- ✓ PUBLISHING SERVICES

CD ROM

PRODUCTION

SALES & SERVICE

LOW MAINTENANCE BEST PRICES EXPANDABLE OPTIONS
We Service ALL Brands!

Call Us First... MegaSoft can customize a complete cost effective system to meet your specific needs.

Autoloaders • Standalones • Labelers • Slevers

YOUR DUPLICATION HEADQUARTERS

MEGAsoft

1-800-222-0490

819 HWY. 33 EAST FREEHOLD, NJ 07728-8431 FAX (908) 442-5658

4660 PINE TIMBERS SUITE 165 HOUSTON, TEXAS 77041-9322

CIRCLE 599 ON READER SERVICE CARD

DUPLICATION EQUIPMENT

For-in-house duplication. MediaFORM is the source. We sell and service high-quality software duplication and labeling equipment. And we can tailor a complete, cost-effective system to meet your specific needs.

MediaFORM
800-220-1215
215-158-9200 (in PA) Fax: 215-158-9554
Eaton, Pennsylvania 19341

Copies Both 5.25 & 3.5
Units. Like Your Machines
for the Price of One

"We tried all the utilities and nothing worked. Total Recall recovered 100% of our data and returned it the same day. These guys are amazing!"

—THE DATA RECOVERY

- Class 80 Clean Room
- Best Rates
- Fastest Turnaround
- Best Success Rate
- Recommended by Major Manufacturers

Absolute Data Recovery!

TOTAL RECALL
800.743.0594

CIRCLE 597 ON READER SERVICE CARD

SOFTWARE DUPLICATION FOR DISKETTES & CD ROM

◆ Highest Quality Media ◆ 24 Hour Turn-Around ◆ Custom Labels & Packaging ◆ Duplication Equipment • In Stock

FREE DISKETTES
with your Equipment Purchase
VERBATIM

BULK DISKS SONY • DYSAN
3.5" LD .39 3.5" HD .49
(Quantity 250)

FREE FORMATting
On your 1st order ◆ 100% Guaranteed

CALL NOW 800-426-0247

PRINCETON DISKETTE

1101 Richmond Avenue
Pt. Pleasant Bch., NJ 08742
Main (908) 892-5655
Fax (908) 892-6186

CIRCLE 600 ON READER SERVICE CARD

SOFTWARE DUPLICATION FROM \$.29

Lowest Prices

- 360K: \$.29
- 720K: \$.69
- 1.2MB: \$.55
- 1.44MB: \$.79

Unit prices include: diskettes and duplication for qty 300. Volume discounts available.

4-Hour Turn-Around

- Certified High Quality Media
- Printing, Packaging and Fulfillment Services
- Tapes & CD-ROM Duplication

Saicom, Inc.
(800) 724-2666
(510) 770-8658 fax

CIRCLE 602 ON READER SERVICE CARD

CONVERSIONS
To OR From Virtually
Any Tape OR Disk Format

- 9-track • 3480
- DEC TK • QIC
- 8mm • 4mm
- Bernoulli • Syquest
- CD-ROM Masters

Conversion Systems Sold
Lowest Prices on Tape/Cartridge
As400, DEC VMS, Unix
Call 8 a.m. to 5:30 p.m. Eastern Time

HORAN DATA SERVICES
1-800-365-4408

78 Walnut Street, Suite 702
Cincinnati, Ohio 45202-2012

CIRCLE 598 ON READER SERVICE CARD

DUPLICATION EQUIPMENT

- StandAlone & PC based units available
- Compact design
- Low maintenance
- Economically priced
- Expandable options to network system
- Fast - Up to 138 3- 1/2" 1.44MB per hour
- One year factory warranty

BULK DISKETTES DATA CARTRIDGES MEDIA SUPPLIES

CALL: CHAMPION DUPLICATORS INC.
1-800-752-2145 FAX 510-459-0247

CIRCLE 601 ON READER SERVICE CARD

Diskette Duplicator

\$1,895

240 copies per hour using an IBM PC/AT or compatible. Autoloaders and labelers are also available.

800-823-4144
RIMAGE Datapath

**DUPLICATION
FROM \$.49****HIGHEST QUALITY MEDIA**

From \$.49 (5.25") and \$.80 (3.50")

- All Diskette Formats
- Custom Labels
- Diskette Mailers/Accessories
- Assembly Services
- Generous Volume Discounts

FORMATTED DISKETTES

QTY	SUNY VERBATIM	OEM GENERIC
250		
3.5" DD	\$.47	\$.45
3.5" HD	\$.57	\$.53

- 10% Discount on First Order
- DOS, Macintosh, or Custom Formats
- Colored Media add \$.05
- Private Labeling/Volume Discounts

800-255-3142Diversified Systems Group, Inc.
PO Box 1114, Issaquah WA 98027

CIRCLE 603 ON READER SERVICE CARD

MEDIA VALUE*OUR NAME SAYS IT ALL!***Diskettes & Tapes**

PC Formatted	OEM Grade
3.5" DS/DD 34¢	3.5" DS/DD 39¢
3.5" DS/HD 44¢	3.5" DS/HD 49¢
5.25" DS/DD 20¢	5.25" DS/DD 21¢
5.25" DS/HD 26¢	5.25" DS/HD 27¢

Recycled OEM Grade

3.5" DS/DD 30¢	5.25" DS/DD 15¢
3.5" DS/HD 40¢	5.25" DS/HD 23¢

5.25" disks include sleeves
All disks priced in lots of 100.
Lower prices for larger quantities.**Data Cartridges**

2120 QIC 80 Bulk	\$13.99
2120 QIC 80 Verbatim (in lots of 5)	\$17.25

Monthly Special

CD Caddies \$4.99 each

800-845-3472**FAX (408) 727-3155**

Diskette and CD Duplication available.

CIRCLE 604 ON READER SERVICE CARD

**It's A
Jungle
Out There!***But PC Magazine
Classified Delivers
The Lion's Share
of the Market.*

PC Magazine makes selling easier by delivering responsive direct buyers twice monthly.

PC Magazine ads trigger immediate response and direct sales.

- of PC Magazine subscribers buy direct
- of PC Magazine subscribers write/phone company for product information
- of PC Magazine subscribers recommend the product to someone else

Call your
PC Magazine Marketplace
account representative
today at:

1-800-825-4237

**"PC Magazine
Marketplace
is the place
where buyers
look when
they're ready to buy."**



"Our own studies prove that PC Magazine pays for itself many times over. We're getting higher quality leads that turn into sales. It produces for us. For leads and revenue generated, PC Magazine Marketplace is number one."

Mike Strand, President
StrandWare, Inc.
bar coding

**Write your own PC Magazine
testimonial and put your ad
here...Start advertising now!**

**Call 800-825-4237
today!**

Services Unlimited
Fantasia
FREE BBS

- INSTANT ACCESS
- FREE Trial Accounts
- National ChatLink With Hundreds of Users Online
- Unlimited Downloads
- Over 15gigs Online
- All High Speed Lines
- Live Tournament Gaming
- Great for All Users

Call Any Time...
24 Hours a Day, 7 Days a Week, 365 Days a Year
Unlimited. We Never Close

714.579.7022

Voice Support Line (714) 961-0000
18 or Older (R/N/I)

CIRCLE 620 ON READER SERVICE CARD

**STOP THROWING
AWAY
TONER
CARTRIDGES**

Empty Cartridges Recycled
Guaranteed To Work Like New

From
\$36

FREE U.P.S. PICK-UP & DELIVERY

National Toner

Recycling & Supply

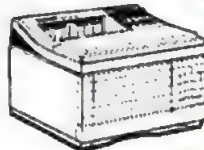
(800) 676-0749

CIRCLE 605 ON READER SERVICE CARD

HP, IBM, Canon, Epson, NEC, Apple

TONERCartridge Remanufacturing
for Laser Printers

prices from
\$45
ship incl.



MICR toner, fonts, software
for check printing.

1-800-722-2804**ADVANTAGE Est.**LASER PRODUCTS, INC. 1987
2030 Powers Ferry Rd. Suite 230
Atlanta, GA 30339

CIRCLE 607 ON READER SERVICE CARD

JetMaster

**Save \$\$\$
in Printing
Costs**

**InkJet Refill System**

The most efficient, **RE-USABLE** jet printer recharge kit available. **Lowest cost per recharge in the world.** Buy one kit, then just buy ink as needed. Available in 2 oz., pint, or gallon size. Ink costs as low as \$1.00 per recharge. Waterproof inks available. Most jet printers supported.

BJ3 (Stylewriter, Canon BubbleJet) \$29.95 JM6 MCI HP Color & Black (BJ-800/800)
JM6 (HP500) Also supports high Cap. Cart.\$69.95
Also supports high Cap. Cart.39.95 Color Jet Ink (2 oz.) (60cc)11.50
Black Jet Ink (2 oz.) (60cc)10.50 BJ6-MCI Color & Blk (BJ-800/800) ..49.95

Computer Friends

14250 NW SCIENCE PARK DR. PORTLAND, OR 97229
TEL. 503 626 2291 FAX 503 643 5379

CIRCLE 606 ON READER SERVICE CARD

**Unleash the power
of your modem**

The Exchange®

Bulletin Board System

The only all-files BBS you'll ever need
Thousands of Free Programs

- Windows
- DOS
- OS2
- Word Processing
- Database
- Games
- Adult Photos (Gifs)
- Animated Adult Movies
- E-Mail
- Live Chat & More

Local Access from over 600 Cities
**Great for beginners & advanced
users of all ages**

We're only a phone call away!
Modem: 614-777-4740

CIRCLE 621 ON READER SERVICE CARD

CD-ROM THE LATEST & JUICIEST RELEASES!

LOWEST PRICES PHONE ORDER 1-800-595-5292 FAX 1-702-796-5655 LARGEST SELECTION

INTERACTIVES

- CD 100 DIRTY TALK (PC) \$45.99
- CD 101 DOORS OF PASSION (PC) \$55.99
- CD 2012 THE DREAM MACHINE (PC/MAC) \$59.99
- CD 2002 ADV. OF SEYMORE BUTTS (PC/MAC) \$59.99
- CD 7052 NIGHTWATCH (PC/MAC) \$59.99
- CD 2100 VIRTUAL VIKENS (PC/MAC) \$59.99
- CDV15 LEGEND OF KUMA SUTRA (PC) \$39.99
- CDV13 101 SEX POSITIONS PT 1 (PC) \$49.99
- CDV14 101 SEX POSITIONS PT 2 (PC) \$49.99
- CDV24 BLONDE JUSTICE (PC) \$29.99
- CDV16 MYSTIQUE OF THE ORIENT (PC/MAC) \$39.99
- SPS100 WILD INNOCENCE (PC/MAC) \$59.99

- SPS200 THE LAST GIRLSOUT (PC/MAC) \$59.99
- CCD100 ADV. OF CHESIE MOORE (PC/MAC) \$49.99
- SIL686 ORIENT EXPRESS (PC) \$59.99

PHOTO DISCS

- CD102 EXTREME DELIGHTS (PC) \$59.99
- CD999 VISUAL FANTASIES (PC) \$59.99
- CD1 9003 ADULT PALATE II (PC/MAC) \$39.99

SPECIAL

OVERSEAS RELEASE!

- IL100 PORNMANIA (PC) \$119.95

Free 64 PAGE COLOR MAGAZINE WITH EVERY ORDER

AMX • CASH • CHECK • M.O. • VISA • MC
NEXT DAY DELIVERY \$16.00 2ND DAY DELIVERY \$9.00
UPS DELIVERY \$4.00
U.S. CURRENCY ONLY AIR REGISTERED \$50.00
FOREIGN ORDER \$100 MINIMUM

CLASSIC MOVIES

- CD7001 HIDDEN OBSESSIONS (PC/MAC) \$59.95
- CD1002 NEW WAVE HUNKERS (PC/MAC) \$49.95
- CD1004 TRAC I LOVE YOU (PC/MAC) \$49.95
- CD1005 INSATIABLE (PC/MAC) \$49.95
- CD1006 CAFE FLESH (PC/MAC) \$49.95
- CD1 101 DEBBIE DOES DALLAS (PC) \$29.99
- CD 107 DUNGEON OF D (PC) \$59.99
- CDV27 THE MASK (PC) \$39.99
- CDV26 IMMORTAL DESIRES (PC) \$39.99

SOME THINGS NEVER DIE
AMX • CASH • CHECK • M.O. • VISA • MC
NEXT DAY DELIVERY \$16.00 2ND DAY DELIVERY \$9.00
UPS DELIVERY \$4.00
U.S. CURRENCY ONLY AIR REGISTERED \$50.00
FOREIGN ORDER \$100 MINIMUM

TM PUBLISHING
2609 S. HIGHLAND DEPT PCM994
LAS VEGAS, NV 89109

PLEASE SPECIFY ♦PC OR ♦MAC ♦♦♦ MUST BE 21 OR OLDER

CIRCLE 614 ON READER SERVICE CARD

MAGICAL escapes BBS

All Adult BBS

New! Hot, local contacts updated daily!!!

TM Publishing is one of the largest adult publishers, bringing you real action On-Line via Magical Escapes BBS

- True Match
- RSVP Singles
- Girl Solo's
- TV Guy
- Musclé Babes
- Forbidden Videos
- Oriental Express
- Modern Gay
- Forbidden Connection
- Leather Controls

and more!

US ACCESS:
24 HOUR BBS
1-800-203-2828

WORLD WIDE ACCESS
100-00 702-796-7300
24 HOURS A DAY

Fax 702-796-5655

Free information & 64 pg color magazine

Send to:
TM PUBLISHING, INC
2609 S. HIGHLAND
DEPT PCM994
LAS VEGAS, NV 89109

FEATURING

- original GIFS not available anywhere else
- exclusive On-Line shopping mall, hard to find videos, books, magazine & more
- latest cd-rom interactives
- hot talk w/1000's of people!
- Sheila's Computer Match
- immediate access to our on-line swinger magazines
- latest & best games on-line
- gay, couples, bi's and all lifestyles

CIRCLE 615 ON READER SERVICE CARD

The Invention Factory

New York's most complete BBS

FREE DOWNLOADS ON YOUR FIRST CALL

- ✓ 14+ gigabytes of files,
- ✓ FULL Internet access
- ✓ on-line games
- ✓ large adult section

CALL THE FACTORY

212/274-8110

BET YOU CAN'T CALL JUST ONCE!

CIRCLE 617 ON READER SERVICE CARD

Gourmet gallery

Continuing our tradition of offering only 100% original GIF files, Gourmet Gallery BBS is becoming one of the nation's largest and most popular sources of new, exciting adult images. Our commitment to offering at least 50 brand new GIF images every week allows you, the user, access to a virtually unlimited supply of GIFs for your collection. We now also offer thumbnail files of our GIFs, so you only download the images you want. We also offer seven of the most popular adult & shareware CD-ROMs online, 24 hours a day.

16 lines available at 1200 - 14.4k. Over 7 gigabytes of files online, and growing. Prices start as low as \$2.75/meg, with no charge for unlimited connect time.

Tired of GIF deja vu? Call us.

adults only, please

408.956.5656

CIRCLE 616 ON READER SERVICE CARD

Connecting Gay America by Computer

- Local access from over 800 cities! *Internet E-Mail & news groups!
- Live, uncensored group & private chat! *Online MatchMaker Database!
- Over 20,000 rated files and pictures! *Over 100 lines!

How to Reach EYE CONTACT:

- * For your local access number, call (800) 848-8980 voice, select #2
- * Use your modem to call the number, settings are 8,n,1
- * When you see CONNECT on your screen, press your <Enter> key
- * There will be some scrambled characters on your screen
- * Then type +EC and press your <Enter> key again (EC is our Host Name)
- * Welcome to EYE CONTACT!

Call EYE CONTACT direct by modem at:
(415) 703-8200

For voice assistance call:
(800) 949-2668

EYE CONTACT

EYE CONTACT is Gay owned and operated

Ask about our interactive titles!

STARWARE

PUBLISHING CORPORATION

20% Off all BBS orders!

THE ADULT CD-ROM SOURCE

Call 1-800-354-5353 or fax 305-426-9801

Foreign orders call 305-426-4552

Call for our FREE color catalog

ANY 3 MULTIMEDIA MOVIES ONLY \$98

971 After Midnight Screen Saver NEW	\$59.88
986 Adventures of Mikki Finn NEW	\$59.88
(2 disc double spin CD set)	
976 The Other Side of Chelsea	\$49.88
977 Deception	\$49.88
980 Hidden Agenda	\$49.88
975 Beverly Hills 90269	\$49.88
978 Murphy's Brown	\$49.88
979 Fisherman's Wife	\$39.88
954 Wicked	\$39.88
955 Betrayal	\$39.88
956 Cat & Mouse	\$49.88

STARWARE BBS 305-428-0012

CIRCLE 618 ON READER SERVICE CARD

FOR QUICKER RESPONSE

FAX TO

(609) 829-0692

Free Product Information

BUSINESS REPLY MAIL

FIRST CLASS MAIL

PERMIT NO. 433

RIVERTON, NJ

POSTAGE WILL BE PAID BY ADDRESSEE



P.O. Box 1687
RIVERTON, NJ 08077-9687

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES



READER SERVICE CARD FREE INFORMATION

IT'S AS EASY AS 1, 2, 3

1. Fill in your name and address and check off your answers to the nine research questions.

2. Circle the numbers on the card that correspond to the ads or articles you'd like more information about.

3. The literature will be mailed to you from the advertiser free of charge.

CIRCLE FOR FREE INFORMATION

Valid after January 31, 1995

001 002 003 004 005 006 007 008 009 010 011 012 013 014 015 016 017 018 019 020 021 022 023 024 025 026 027 028 029 030 031 032 033 034 035 036 037 038 039 040 041 042 043 044 045 046 047 048 049 050
051 052 053 054 055 056 057 058 059 060 061 062 063 064 065 066 067 068 069 070 071 072 073 074 075 076 077 078 079 080 081 082 083 084 085 086 087 088 089 090 091 092 093 094 095 096 097 098 099 100
101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150
151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200
201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250
251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300
301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350
351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400
401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450
451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500
501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550
551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600
601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650
651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700
701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750
751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800
801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850
851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900
901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950
951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999

1. Do you work in a DP/MIS dept.?
01. ☐ Yes 02. ☐ No

2. Please indicate your company or organization's primary business activity: (Check one)

01. ☐ Manufacturer Computer Equip., Computers, Software
02. ☐ Manufacturer-Aerospace
03. ☐ Manufacturer-Other
04. ☐ Systems House
05. ☐ Computer Consultant
06. ☐ Computer Retailer/VAR/VAD Distributor
07. ☐ Communications
08. ☐ Finance/Banking/Insurance/Real Estate/Accounting
09. ☐ Education
10. ☐ Government
11. ☐ Research and Development
12. ☐ Data Processing/Computer Service
13. ☐ Health/Medical/Legal Service
14. ☐ Engineering/Architecture

15. ☐ Agr./Const./Mining/Oil/Transp./Utilities
16. ☐ Non-Computer Retailer/Dist.
17. ☐ Other Business or Service

3. Please indicate your primary business function: (Check one)

01. ☐ DP/MIS
02. ☐ Systems, Programming
03. ☐ Communications
04. ☐ Engineering
05. ☐ Res./Dev./Scientific
06. ☐ Accounting/Finance
07. ☐ Computer Consulting
08. ☐ Purchasing
09. ☐ Operations
10. ☐ Production
11. ☐ Education/Training
12. ☐ Marketing/Sales
13. ☐ Medical/Legal
14. ☐ Admin./Mgmt.

4. Is your company a reseller?
01. ☐ Yes 02. ☐ No

5. For how many IBM PCs and compatibles do you specify brands of products:
01. ☐ 10 or less 03. ☐ 26-99
02. ☐ 11-25 04. ☐ 100 or more

6. Are there any PCs in your office?
01. ☐ Linked to mainframe
02. ☐ Linked to mini
03. ☐ Networked together

7. Please check the equipment currently installed at your location: (Check all that apply)

01. ☐ IBM or Compatible PCs
02. ☐ IBM or Compatible Mainframes
03. ☐ IBM or Compatible Minis
04. ☐ Macintosh
05. ☐ CD-ROM
06. ☐ Windows

8. Do you plan to buy any PC products?
01. ☐ Now 03. ☐ In 7 to 12 months
02. ☐ In 4 to 6 months 04. ☐ No definite plans

9. Number of employees in your entire company:
01. ☐ 25 or less 03. ☐ 100-499 05. ☐ 1000 or more
02. ☐ 26-99 04. ☐ 500-999

Name

PC 9/27-5

Title

Telephone

Company Name

Address

City

State

Zip

5 ☐ Please send me a one-year (22-issue) subscription to PC Magazine for \$34.94 (U.S. price); all other countries add \$36.00 for additional postage

Call a Party First Try Card To 609-829-0692



READER SERVICE CARD FREE INFORMATION

IT'S AS EASY AS 1, 2, 3

1. Fill in your name and address and check off your answers to the nine research questions.

2. Circle the numbers on the card that correspond to the ads or articles you'd like more information about.

3. The literature will be mailed to you from the advertiser free of charge.

CIRCLE FOR FREE INFORMATION

Valid after January 31, 1995

001	002	003	004	005	006	007	008	009	010	011	012	013	014	015	016	017	018	019	020	021	022	023	024	025	026	027	028	029	030	031	032	033	034	035	036	037	038	039	040	041	042	043	044	045	046	047	048	049	050
051	052	053	054	055	056	057	058	059	060	061	062	063	064	065	066	067	068	069	070	071	072	073	074	075	076	077	078	079	080	081	082	083	084	085	086	087	088	089	090	091	092	093	094	095	096	097	098	099	100
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200
201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250
251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300
301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350
351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400
401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450
451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500
501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550
551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600
601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650
651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700
701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750
751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800
801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850
851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900
901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950
951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000

1. Do you work in a DP/MIS dept.?
01. ☐ Yes 02. ☐ No

2. Please indicate your company or organization's primary business activity: (Check one)

01. ☐ Manufacturer Computer Equip., Computers, Software
02. ☐ Manufacturer-Aerospace
03. ☐ Manufacturer-Other
04. ☐ Systems House
05. ☐ Computer Consultant
06. ☐ Computer Retailer/VAR/VAD Distributor
07. ☐ Communications
08. ☐ Finance/Banking/Insurance/Real Estate/Accounting
09. ☐ Education
10. ☐ Government
11. ☐ Research and Development
12. ☐ Data Processing/Computer Service
13. ☐ Health/Medical/Legal Service
14. ☐ Engineering/Architecture

16. ☐ Agr./Const./Mining/Oil/Transp./Utilities
17. ☐ Non-Computer Retailer/Dist.
18. ☐ Other Business or Service

3. Please indicate your primary business function: (Check one)

01. ☐ DP/MIS
02. ☐ Systems, Programming
03. ☐ Communications
04. ☐ Engineering
05. ☐ Res./Dev./Scientific
06. ☐ Accounting/Finance
07. ☐ Computer Consulting
08. ☐ Purchasing
09. ☐ Operations
10. ☐ Production
11. ☐ Education/Training
12. ☐ Marketing/Sales
13. ☐ Medical/Legal
14. ☐ Admin./Mgmt.

4. Is your company a reseller?
01. ☐ Yes 02. ☐ No

5. For how many IBM PCs and compatibles do you specify brands of products:

01. ☐ 10 or less 03. ☐ 26-99
02. ☐ 11-25 04. ☐ 100 or more

6. Are there any PCs in your office?

01. ☐ Linked to mainframe
02. ☐ Linked to mini
03. ☐ Networked together

7. Please check the equipment currently installed at your location: (Check all that apply)

01. ☐ IBM or Compatible PCs
02. ☐ IBM or Compatible Mainframes
03. ☐ IBM or Compatible Minis
04. ☐ Macintosh
05. ☐ CD-ROM
06. ☐ Windows

8. Do you plan to buy any PC products?

01. ☐ Now 03. ☐ In 7 to 12 months
02. ☐ In 4 to 6 months 04. ☐ No definite plans

9. Number of employees in your entire company:

01. ☐ 25 or less 03. ☐ 100-499 05. ☐ 1000 or more
02. ☐ 26-99 04. ☐ 500-999

Name

PC 9/27-5

Title

Telephone

Company Name

Address

City

State

Zip

5. Please send me a one-year (22-issue) subscription to PC Magazine for \$34.94 (U.S. price); all other countries add \$36.00 for additional postage.

In a Hurry? Fax This Card To 609-829-0692

FOR QUICKER RESPONSE

FAX TO

(609) 829-0692

Free Product Information

BUSINESS REPLY MAIL

FIRST CLASS MAIL

PERMIT NO. 433

RIVERTON, NJ

POSTAGE WILL BE PAID BY ADDRESSEE

P.O. Box 1687
RIVERTON, NJ 08077-9687NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

HARDWARE/BATTERIES

INCREASE YOUR BATTERY LIFE!

Your "2-Hr" battery only lasts 1 Hr? Try our 3000+ Long-Life Batteries, Chargers & Car Cords, for Notebook, Cellular, Camcorder, Battery Boost Software \$25! Order FREE catalog/guide to longer battery life! Best Prices, 1 Yr Wrrnty, V/MC/PO.

POWER EXPRESS

4976 Stuckey Drive, San Jose, CA 95124-5120
Order 24hrs/Day! 800-769-3739 F408-559-5969

CIRCLE 668 ON READER SERVICE CARD

COMPUTER BATTERIES & MORE

Batteries for laptop/NB/PB, CMOS, camcorders, cameras, RC vehicles, toys, cordless phones/drills/shavers, cellular, remotes, pet fences. UPS/LANS, N-Cads, chargers, etc. WE REBUILD! CALL & ASK! WHOLESALE! V/MC/AmX/Dscr/POs.

BATTERY EXPRESS

713 Gladstone St., Parkersburg, WV 26101-5661
800-666-2296/304-428-2296 fax: 304-428-2297

CIRCLE 667 ON READER SERVICE CARD

BOARDS/COMPONENTS/CHIPS

VESA LOCAL BUS CIRCUIT BOARDS

Manufacturers/distributors of the guaranteed fastest video cards, motherboards (w or w/o CPU) and controller cards. By far the best price and tech support...since 1986. Please call for free info. 486/P24T MB w/256KCC & iDX2 66 CPU=\$430.

HSB COMPUTER WHOLESALE

34208 Aurora Rd. #297, Cleveland, OH 44139
Tel: 1-800-497-0401 Fax: (216) 498-1374

CIRCLE 668 ON READER SERVICE CARD

COMMUNICATIONS

KEYBOARD, VIDEO, MOUSE

EXTENSION with EXTENDER
SPLITTING with COMPANION
SWITCHING with COMMANDER
Boosts SIGNALS UP to 600 FT. Control Up to 96PC's with one KEYBOARD and MONITOR.

CYBEX CORPORATION

4912 Research Drive, Huntsville, AL 35805
PHONE 205-430-4000 FAX 205-430-4030

CIRCLE 669 ON READER SERVICE CARD

INPUT/DATA ACQUISITION/BAR CODE/POS

BAR CODE DISCOUNT WAREHOUSE

will not be undersold! Your source for all your bar code needs. Laser and CCD scanners, mag stripe and wedge readers, bar code printers and software. We offer major brands at the best prices.
1-800-888-BCDW

BAR CODE DISCOUNT WAREHOUSE

14761 Pearl Rd., #257, Strongsville, OH 44136
Tel: (216) 273-4746 Fax: (216) 273-4623

CIRCLE 670 ON READER SERVICE CARD

SOFTWARE/BUSINESS APPLICATIONS

THE EASIEST OF THEM ALL™

Full featured FoxPro based Integrated Accounting for PC's. Faster, More Complete and Easier to Use. See PC Magazine May 12, 1992. Only \$295.00 Call for free info kit, demo disk and upgrade offer.

PC ACCOUNTANT™

P.O.Box 2278, Kirkland, WA 98083
800-827-1303 206 827-4361

CIRCLE 671 ON READER SERVICE CARD

PERSONAL NETWORKING TUTOR

Introductory Offer \$99!
MS Windows Based Tutorial & Reference System!
Instant Access to THOUSANDS of Network topics.
Tutorials on PC LANS, Client/Server, TCP/IP, ATM & many more! VISA/MC, 30 day money back!

BIGHORN SOFTWARE

Phone: 1-800-475-5445 Fax: (303) 467-2796
P.O. Box 745717, Arvada, CO 80006-5717

CIRCLE 672 ON READER SERVICE CARD

CD-ROM TITLES

FREE CD FREE CD FREE CD

Sample CD-ROM containing fonts, icons, BMP's, clipart and WAV files. Please send \$4.95 for shipping and handling (non-refundable). Other CD's available: fonts and clipart, including World Class Fonts-6000 fonts w/book for \$49.99.

FANTAZIA CONCEPTS, INC.

P.O. Box 5142 Willowick, OH 44095
(216) 951-5666 or (800) 951-0877

CIRCLE 673 ON READER SERVICE CARD

THE MULTIMEDIA SOURCE!

The Exciting world of Multimedia at INTERVISION (formerly Plato's Express). Hundreds of the latest CD ROM titles UPGR Kits, Video Capture Boards, Sound Cards. Call for FREE CATALOG!
Adult Only CD Also Available.

INTERVISION

13122 NE 20th #C., Bellevue, WA 98005
800-877-4355 or FAX 206-861-0533

CIRCLE 674 ON READER SERVICE CARD

CD-ROMS-MAC-IBM-SEGA-CDTV

Prevue CD-ROMS. We carry all popular formats. Karaoke, Art, Lit, D/Top Publishing, Fonts, Utis, Education, Graphics and above all — GAMES. Apply Prevue to buy or return to prevue more. FREE CATALOG 1-800-433-2938.

WEDGWOOD RENTAL

5316 Woodway Dr., Fort Worth, TX 76133
1-800-433-2938 or 817-292-7353

CIRCLE 675 ON READER SERVICE CARD

Best CDROM's from Walnut Creek

Cica MS Win 4000 hot Windows prgrms \$29.95
Giga Games 4000 fun Dos-Windows Games \$39.95
Sintel MSDOS 680 MB DOS Shareware \$29.95
Hobbes OS/2 640 MB Free/Shareware \$29.95
Source Code 650 MB Unix and Dos code \$39.95

Walnut Creek CDROM

Guaranteed! 4041 Pike #D522, Concord CA 94520
VI/MC/AX/Dis 800-786-9907 Fx:510-674-0821

CIRCLE 676 ON READER SERVICE CARD

The Workflow CD-ROM Sampler

A multimedia resource that saves you hours of research time! You'll find in-depth analysis about this new industry; see demonstrations of software and presentations on some of the leading workflow solutions. \$99 (V/MC)

CREATIVE NETWORKS, INC.

480 Lytton Ave., Ste. 6, Palo Alto, CA 94301
415-326-9926 Fax: 415-326-4014

CIRCLE 677 ON READER SERVICE CARD

CELLULAR PHONES

TWO PHONES - ONE NUMBER

Change NAM & ESN info on your PC for Motorola, Mitsubishi, Panasonic, NEC Cellular Phones & have an extension. Why pay two bills? Call our fax on demand for details. Only \$495 with free technical support.

Cellular Press

421 N. Rodeo #15318 Beverly Hills, CA 90210
Fax/Demand: 800-438-4511 Ph: 310-289-2174

DATA BASE

dBASE file access from C, Basic...

CodeBase gives complete database management with multi-user dBASE, FoxPro or Clipper file compatibility from C, C++, Basic or Pascal. Report Writer and Data Entry software is included. Full 60-day money back guarantee.

SEQUITER SOFTWARE INC.

PO BOX 575 New Market, NH 03857-0575
Call (403) 437-2410, Fax (403) 436-2999

CIRCLE 679 ON READER SERVICE CARD

DATA ENTRY

The Data Entry Emulator™

Full featured, heads-down data entry with two-pass verification, edit language, operator stats, batch control, output record reformat, on-line help, free tech support. From \$395. LAN version available.

Computer Keyes

21929 Makah Road, Woodway, WA 98020
800-356-0203/206-776-6443/Fax:206-776-7210

FINANCIAL ACCOUNTING

Computer Checks \$24.95

Why Waste Money? Quicken Compatible, also Simply Money, MYM, Money, Hooper and many more! Continuous and laser/inkjet. Our checks ship within one week and are fully guaranteed. 100 Free Envelopes with First Check order.

Designer Checks, Inc.

PO Box 13387, Birmingham, AL 35202
800-239-4087 Fax 800-774-1118

CIRCLE 681 ON READER SERVICE CARD

WINDOWS ACCOUNTING POWER!

CONNECTED Accounting for Windows and Mac. Ready to manage business operations, accounting requirements and company growth. GL/AR/AP•Inv Cntrl•Invoices•POs•Job Cost•Bill of Mtlis•Custom Reports•MultiUser•From \$895•QIs Wanted.

EveryWare Development Corp.

6543 Mississauga Rd, Mississauga, ON L5N 1A6
(905) 819-1173 ext. 227

CIRCLE 682 ON READER SERVICE CARD

FOREIGN LANGUAGES/FONT/TRANSLATION

LEADER IN FOREIGN LANGUAGE

WE SET THE STANDARD. Over 100 languages \$25 & up. Translators, tutorials, fonts, spell checkers & related software. Japanese, Chinese, Spanish speaking staff. Call for samples/prices. FREE interactive catalog. LOWEST PRICES GUARANTEED.

CHARACTER LANGUAGE RESOURCE

2130 Sawtelle Blvd.#304A, Los Angeles, CA 90025
800-569-2099/310-996-2300/FAX 310-996-2303

CIRCLE 683 ON READER SERVICE CARD

MAILING LIST MANAGEMENT

Mail Order Manager (™)

America's favorite integrated solution for mail/phone order business - order entry, credit card processing, UPS manifest, accounting, telemkt'g, mailing list mgmt & more! Single & Multi-user systems starting at \$1195. Working Demo \$25 (Ref)

Dydacomp Development Corp.

150 River Road, Ste N1 Dept.PCM, Montville, NJ 07045 Tel:800-858-DMOM or 201-335-1256

CIRCLE 684 ON READER SERVICE CARD

PROGRAMMING TOOLS/LANGUAGES

Fortran 90 and 77

• New! 32-Bit Fortran 90 • FORTRAN 77 for Students and Professionals • Downsizing or New Code • Complete Suite of Tools • Free Technical Support • A Decade of PC Fortrans

Lahey Computer Systems

800-548-4778 or 702-831-2500
Fax: 702-831-8123

CIRCLE 691 ON READER SERVICE CARD

NCSS 5.x Series - \$125

"Best value & easiest to learn/use" PC-Week. Menus/Spreadsheet. Means, etc. Regression, t-tests, ANOVA. Factor, cluster & discriminant. Cross tabs. Nonparametrics. Histograms. Plots. Reads ASCII/Lotus. Many extra modules.

NCSS

329 North 1000 East, Kaysville, UT 84037
Phone: 801-546-0445 FAX: 801-546-3907

CIRCLE 696 ON READER SERVICE CARD

Save \$\$\$ on Your Mailings!

Postalsoft DeskTop Mailer helps you save on postage and automate mailings! Correct addresses & add ZIP+4; presort 1st/3rd Class mail; manage lists & find dupes; print barcoded labels—all from an easy-to-use Windows interface.

Postalsoft, Inc.

4439 Mormon Coulee Rd, La Crosse WI 54601
TEL: (800) 831-MAIL(6245) FAX: (608) 788-1188

CIRCLE 685 ON READER SERVICE CARD

Visual Basic Programming Tools

Add-on tools for VB, VB_DOS, QuickBASIC and PDS, all with tutorials and full source. Custom controls, DLL's, general purpose toolboxes, assembly routines, graphics, screen design, TSR's and much more. No royalties. Free demo & catalog.

CRESCENT SOFTWARE, INC.

11 Bailey Avenue, Ridgefield, CT 06877-4505
1-800-35BASIC 203-438-5300 Fax: 203-431-4626

#1 in Surveys - StatPac Gold IV

Professional's choice for survey & marketing research. User-friendly, comprehensive & dependable. Camera ready tables & graphics. Basic & advanced statistics. CRT & telephone interviewing. Easiest to learn. Guaranteed.

StatPac Inc.

4532 France Ave. S., Minneapolis, MN 55410
Tel: (612) 925-0159 Fax: (612) 925-0851

CIRCLE 697 ON READER SERVICE CARD

MANUFACTURING/INVENTORY

MAINTENANCE MANAGEMENT

PC-based system for the small to medium size business. FEATURES: Work Orders (space for detail instructions & safe work procedures), equipment descriptions, historical data, operating & analytical reports, inventory. Write for free Demo!!

PENGUIN COMPUTER CONSULTANTS

P.O.Box 20485, San Jose, CA 95160
800-521-0545 (408)997-7703 Fax (408)927-0570

CIRCLE 686 ON READER SERVICE CARD

REAL ESTATE

Property Management

With Rental-Ease save \$\$ on your investment! Guaranteed to be the easiest & fastest property management system available at any price. Versions for owners, professionals, networks. \$395 to \$1295. Demo \$10. Dealers welcome!

Strategic Office Systems

688 N.500 W.#61, Mt. Pleasant, UT 84647
(800) 942-6784 or (801) 462-2130

CIRCLE 693 ON READER SERVICE CARD

SERVICES/COMPUTER INSURANCE

Insures Your Computer

The COMPUTEROWNERS™ insurance policy repairs or replaces hardware, media and purchased software. Rates as low as \$49 a year covers theft, fire, accidents, power surge and more! Call for immediate coverage or info. 1-800-800-1492.

Safeware, The Insurance Agency Inc.

2929 N. High St., PO Box 02211, Columbus, Ohio 43202
1-800-SAFWARE

CIRCLE 698 ON READER SERVICE CARD

RELIGION

Bible Study Software

For 10 years we have remained the leading Bible study software company. Think of us as a Bible bookstore with an integrated family of software products for your Bible study needs! Call for a FREE catalog!

Bible Research Systems

2013 Wells Branch Pkwy. #304 Austin, TX 78728
1-800-423-1228 1-512-251-7541

SCANNING SERVICES

FOR HIRE - TYPIST - 2,400 WPM

- Fast, Accurate, Inexpensive. Overnight Svc Avail
- Any paper-docs, financials, lists, manuscripts, etc.
- Converted to file for any PC or MAC program.
- Output to diskette, CD-ROM, or tape.
- Complete Scanning/OCR/Imaging services

ScanType Service Corp.

6557 Via Barona, Carlsbad, CA 92009
(800) 597-SCAN In CALIF: (800) 300-SCAN

CIRCLE 699 ON READER SERVICE CARD

Over 3,100 Satisfied Users!

Mfg. inventory control, multi-level BOMs, integrated purchasing costs \$1995. Optional scheduling module w/work orders, time-phased prod.scheduling, & MRP \$800. \$ back guarantee. Feature-rich demo prints 60+sample reports — Just \$5. V/MC/Amex

Microcomputer Specialists, Inc.

P.O. Box 795, Woodstock, VT 05091
Call toll-free 1-800-833-1500

CIRCLE 687 ON READER SERVICE CARD

INVENTORY MANAGEMENT

Stock-Master 4.0, com. grade system, has Stock Status Rptg, PO Write & Track, Trend Analysis, QC Rptg, Trans Hist Detail Analysis, Multi Loc support, BOM, Matl Req Planning, Serial/Lot No Track, Quote/Ord/Inv Prep.

Applied Micro Business Systems, Inc.

177F Riverside Ave., Newport Beach, CA 92663
714-759-0582

CIRCLE 688 ON READER SERVICE CARD

CHURCH MANAGEMENT SOFTWARE

Membership, contributions and accounting software that saves big on church mailing costs with bar codes and carrier routes. PowerChurch Plus includes church fund accounting, A/P and payroll for \$795. Call today to order free info in the mail.

F1 SOFTWARE

208 Ridgefield Drive, Asheville, NC 28806
1 (800) 486-1800

CIRCLE 694 ON READER SERVICE CARD

Multimedia Training Workshop

Participants will build an application from concept to realization in a three day hands-on workshop covering animation, audio, authoring, graphics, and video. Catch the multimedia fever, Train Now!

TACC INC.

PO Box 3993 Naperville, IL 60567
(708) 897-2749

CIRCLE 700 ON READER SERVICE CARD

MEDICAL/DENTAL

Lytic Medical/Dental

Advanced practice mgmt for DOS & Win. Patient & insurance billing, accts receivable, electronic claims, practice mgmt, prsnl info mgmt, prsnl fin., sched., graphics, laser forms, multi-user, multi-provider & more. 60 day money back guarantee.

Lytic Systems, Inc.

7050 Union Park Center, Suite 390 Midvale, UT 84047
Tel: 1-800-735-1991

CIRCLE 689 ON READER SERVICE CARD

STATISTICAL/RESEARCH

The Survey System

Analyzes: marketing, public opinion, customer satisfaction, employee attitude surveys. Handles mail, personal, phone, scanner, disk-by-mail or computer interviews. Records verbatim text & voice answers. Powerful, flexible, user friendly. Free support.

Creative Research Systems

140 Vista View #100, Petaluma, CA 94952-4728
Ph.(707)765-1001/Fax (707)765-1068

CIRCLE 695 ON READER SERVICE CARD

MISC./BOOKS/CATALOGUES

COMPUTER BOOK STORE

Now on the Internet! 15% off books from 140 publishers. CD-ROMs, Windows, Internet, Macintosh, UNIX. Download catalog from CompuServe (GO CBK). Electronic catalogs avail. by anonymous FTP from ftp.compbooks.com. Worldwide shipping.

CompuBooks

RR 1 BOX 271D, Cedar Creek TX 78612 USA
512-321-9652 FAX321-4525 Orders800-880-6818

October 2 - 5, 1994
Atlanta, Georgia

- ◆ Over 140 seminars, case studies and panels
- ◆ Keynote presentations by Gary Hall and Ron Archer
- ◆ Expo of over 150 leading industry providers
- ◆ Networking opportunities with over 2,000 professionals
- ◆ Classrooms by Borland, Lotus, Microsoft, Novell and WordPerfect

THE 1994

COMPUTER TRAINING & SUPPORT CONFERENCE

Sponsored By:



Help
Desk
Institute

MacWEEK



PCWEEK

MacUser

For More Information:

1-800-34-TRAIN

(outside the US: 617-252-5187)

Complete Tracks On:

Management

Business realities are forcing new issues onto the management landscape, such as how to service a rightsized or downsized organization—especially if your department has been trimmed as well.

Retooling

The transition to new technologies such as client/server requires that new attitudes, paradigms and skills sets be adopted with razor-thin timeframes.

Certification & Testing

Will you be asked to certify your users' knowledge? Should training and support staff be certified? Learn more about these hotly debated issues.

Training

Trainers today serve many roles, including presenter, developer, outsourcing coordinator, learning facilitator and systems design team member. What skills are required for these new responsibilities?

Business & Vendor

The training and support markets are wrought with competition. These sessions provide strategies to help your business prosper.

Documentation

The convergence of training, support and documentation, combined with new online documentation tools, presents new challenges for integrating these various elements.

Interactive Multimedia

The rise of interactive multimedia presents both challenges and opportunities. Managers must decide when to apply multimedia, select an appropriate delivery mechanism and ensure performance improvement.

Service

Today's passion for quality demands effective service strategies across the organization. What is required to optimize your department's service?

Workplace Technology

Increasing computer literacy and sophisticated technologies pose new challenges for our profession. How do you transition to new environments and technologies?



Advertising Sales Staff

One Park Avenue,
New York, NY 10016
212 503-5100

DISPLAY ADVERTISING

Dan Rosenweig - Associate Publisher
(212) 503-5354
Anna Zornosa - Associate Publisher/West Coast
(415) 378-5505
Lon Otremba - Associate Publisher/East Coast
(212) 503-4453
Bill Stephen National Sales Manager
(212) 503-5626
Ad Coordination Supervisor
Christine Holsten
(212) 503-5264
Advertising Coordinator
Julie Eigo
(212) 503-5107

NETWORK EDITION

Kimberly White - Eastern Advertising Manager/ Network Products - Eastern Region & Midwest
(617) 393-3056
Account Representative
Andrew Zeiger
(212) 503-5162
Paul Klein - Western Advertising Manager/ Network Products - Western Region & Southwest
(415) 378-5546
Account Representative
Tim Castelli
(212) 503-5125

MA, NH, VT, ME, RI, Canada

District Sales Manager
Michael Bird (617) 393-3058
10 President's Landing, Mystic Center
Medford, MA 02155
(617) 393-3055
Account Representative
Kirk McDonald
(212) 503-5970

CT, NY, NJ, PA

District Sales Manager
Todd Anderman (212) 503-5149
One Park Avenue, 4th Floor
New York, NY 10016
(212) 503-5100
Account Representative
Elizabeth Cusick
(212) 503-5112

DE, MD, DC, VA, WV, NC, SC, AL, MS, TN, AR, KY, GA, FL

District Sales Manager
Frank Quigley (404) 814-8950
3405 Piedmont Road NE, Suite 460
Atlanta, GA 30305
(404) 814-8940
Account Representative
Lynn Bader
(212) 503-5032

NE, WI, IL, IN, KS, MN, MO, MI, IA, ND, SD, OH

District Sales Manager
Ken Beach (312) 214-7330
150 North Wacker Drive, 25th Floor
Chicago, IL 60606
(312) 214-7300
Sr. Account Representative
Beth Boyle
(212) 503-5047

TX, OK, LA, NM

District Sales Manager
Tim Colby (214) 360-5725
5956 Sherry Lane, Suite 625
Dallas, TX 75225
(214) 360-5700
Sr. Account Representative
Stephanie Brzozowski
(212) 503-5675

Mark Malloy - Southwest Area Manager

(310) 268-1331

CA (Los Angeles), AZ

District Sales Manager
Julie York (310) 268-1381
11766 Wilshire Blvd., Suite 1550
Los Angeles, CA 90025
(310) 268-1300
Account Representative
R.J. Kirkland
(212) 503-5113

CA (San Diego & Orange County), HI

District Sales Manager
Robin Kofsky (714) 852-5920
18301 Von Karmen Avenue, Suite 330
Irvine, CA 92715
(714) 852-5914
Account Representative
Elizabeth O'Connor
(212) 503-5040

CA (San Jose), ID

Senior District Sales Manager
Michael Klein (415) 378-5521
110 Marsh Drive, Suite 103
Foster City, CA 94404
(415) 378-5500
Account Representative
Wendy Nathan
(212) 503-5024

Mike Kisseberth - Northwest Area Manager

(415) 378-5510

CA (San Francisco & North), OR, WA, NV

District Sales Manager
Ira Becker (415) 378-5523
110 Marsh Drive, Suite 103
Foster City, CA 94404
(415) 378-5500
Account Representative
Jeff Green
(212) 503-5129

CA (South San Francisco to Mountainview), CO, UT, WY, AK, MT

District Sales Manager
Kristy Newton (415) 378-6859
110 Marsh Drive, Suite 103
Foster City, CA 94404
(415) 378-5500
Account Representative
Jennifer Williams
(212) 503-5011

CENTRAL ADVERTISING

VP, Central Advertising
Robert A. Bader
Director of Sales and Marketing
Paul Fusco
Sales Manager
Monte Wasch
Production Director
Vicki Egan
Sr. Production Coordinator
Nadine Messier
Sr. Production Coordinator
Berhan Asmarom
Advertising Coordinator
Audi Marie Tinoso

AL, AR, FL, GA, LA, MS, NC, SC, TN, TX, WV, KY

Account Manager
Leslie Eddy
(212) 503-5171

AK, AZ, CA (209, 213, 310, 619, 714, 805, 818, 909), NM, OK, HI

Account Representative
Carolyn Goldfarb
(212) 503-5076

CT, IA, IL, IN, ME, MI, NH, NJ, RI, VT, WI

Sr. Account Representative
Bill Herbst
(212) 503-5193

CA (209, 408, 410, 415, 707, 916)

Account Representative
(212) 503-5118

DC, NY, PA, DE, MD, OH, MO, VA, CN, Foreign

Account Representative
James Meyer
(212) 503-5150

CO, ID, KS, MN, MT, ND, NE, NV, OR, SD, UT, WA, WY

Account Representative
Maggie Hewit
(212) 503-5156
Business Card Advertising
Call: 1-800-825-4237
PC Magazine Marketplace
3rd Floor, One Park Ave.
New York, NY 10016

For more information regarding display advertising please call:
212 503-5100
1-800-33MAG AD

For more information regarding central advertising please call:
212 508-5115
1-800-825-4237

Advertisers' Index COMPANIES

Reader Service No.	Advertiser	Page
*	3 Com Corporation	246-247
*	3 Com Corporation	249
376	3 Com Corporation	251
910	3M Data Storage Products	101
034	Acer America	81-85
934	Adaptec	NE17
226	ADI Systems Inc	230-231
*	AMBRA COMPUTER CORPORATION	108-109
*	AMBRA COMPUTER CORPORATION	218-219
162	American Power Conversion	53
025	American Small Business Computers	381
270	AMS	129
235	AMS	377
336	Arlington Computer Products	347-349
254	Artisoft Inc	146
*	AST Research	20-21
*	AST Research	90-91
178	ATI Technologies Inc	275
012	Austin Direct	125-127
325	Austin Direct	351
287	Borland International	6
220	Borland International	63-67
015	Bulldog Computer Products	374
292	Caere Corporation	41
*	Canon Computer Systems	281
868	Cheyenne Software	NE7
894	Cheyenne Software	NE12
872	Combinet	NE15
308	Compaq Computer Corporation	74-75
*	Compaq Computer Corporation	117
137	Compaq Computer Corporation	240-241
126	CompuAdd	76-77
144	CompUSA Direct	268-269
300	Computability	326-327
075	Computer Associates	2-3
159	COMPUTER DISCOUNT WAREHOUSE	338-339
109	COMPUTER DISCOUNT WAREHOUSE	340-341
158	Computer Library	170
224	Conner Peripherals	174
322	Corel Corporation	51
020	Corel Corporation	145
011	Corel Corporation	265
086	Creative Labs	34-35
369	CTX International	158-159
329	CTX International	239
*	DEE ONE SYSTEMS	376
*	Dell Computer Corporation	C5-C8
*	Dell Computer Corporation	167-169
*	Dell Computer Corporation	322-323
050	Delphi Internet Services	86
176	Diamond Computer Systems, Inc	98
*	Digital Equipment Corporation	313
*	Epson America	10-11
090	Everex Computer Systems	89
305	ExpoTech/VTech	366-369
014	First Source International	352-353

Reader Service No.	Advertiser	Page
089	FOSA Computer Inc	382
105	Frame Technology	279
200	FTG Data Systems	4
*	Gateway 2000	49
*	Gateway 2000	48a-I
083	General Electric/Rental	122-123
371	Goldstar	18
391/138	H.Co Memory Upgrades	383
136	Hayes Microcomputer Products	157
116	Hewlett Packard Peripheral Group	24-25
*	Hewlett Packard	58-59
*	Hewlett Packard	78
*	Hewlett Packard	96-97
*	Hewlett Packard	213-215
094	Hi Tech Components	350
*	IBM Corporation	148-152
*	IBM Corporation	173
*	IBM Corporation	255
*	IBM PC Corporation	16-17
052	Inmac	189
027	Insight Direct, Inc	422
*	Intel Corporation	222-225
882	Intel Corporation	NE2-NE3
358	Intergraph Corp	164
048	Intergraph Corp	277
242	Kenosha Computer Center	378
106	Kingston Technology	302
019	L.A. Trade	356
*	Lotus Development Corporation	181-186
067	Mag Innovision	206-207
018	MegaHaus	355
855	Micro Solutions Computer Products	245
862	Microcom	55
893	Microcom	NE29
230	Micrografix	273
370	Micron Computer, Inc	70-71
119	Micron Computer, Inc	102-106
*	Microsoft	60
*	Microsoft	C2-C4,p1
114	MIDLAND COMPUTERMART	354
010	Midwest Computer Works	360
398	Midwest Micro	328-335
280	Mitsubishi Display Products	252
177	MPC Technology, Inc	94
283	Nanao Corporation	203
045	NEC Technologies	26-27
877	NetManage, Inc	NE11
032	Nissei Sangyo America	201
*	Nokia	217
858	NOTIS Systems, Inc	384
950	Novell, Inc	NE22-NE23
890	Novell, Inc	NE30
060	Ocean Isle Software	297
*	Oracle Corp	NE4
*	PC Connection	343-345
080	PC Power & Cooling	100

Reader Service No.	Advertiser	Page
199	PC Zones	358-359
092	PCs Compleat	370-371
268	PCs Compleat	372-373
393	Peachtree Software	72
867	Performance Technology	NE14
026	Personics	290
006	Phillips	210-211
246	Phillips	243
098	Pinnacle Micro	337
284	Plustek, Inc	256
148	Primavera Systems	45
929	Proteon Inc	NE13
375	Publishers Toolbox	375
884	QMS	NE9
899	QMS	NE26
047	Roland Corporation	5
046	Samsung Information Systems	190
*	Seagate Technology	36
*	ShapeWare	234-235
*	Sharp Electronics Corp	13
399	Sigma Designs, Inc	425
150	SmartPrint/Dresselhaus	242
936	Smith Micro Software, Inc	NE19
*	Software Publishing	267
043	SPSS, Inc	380
057	StatSoft	57
081	Sunshine Computers	357
334	Symantec Corporation	28
008	Tagram Systems Corporation	119
357	TC Computers	361
001	Tektronix Inc	43
368	Texas Instruments	227
379	Toshiba America	178-179
892	Triton Technologies Inc	NE10
866	US Robotics Inc	23
920	US Robotics Inc	NE21
065	USA Flex	362-363
210	USA Flex	364-365
343	Valueline	379
118	View Sonic	244
373	Visual Software	261
085	WinBook Computer Corporation	163
864	Wollongong Group	NE24
*	WordPerfect Corporation	14-15
*	Zenith Data Systems	110-111
*	Zenith Data Systems	132-133
063	Zeos Int'l	33
038	Zeos Int'l	92
155	Zeos Int'l	137-142
125	Zeos Int'l	161
151	Zeos Int'l	195-198
*	Ziff Davis Corporate Marketing	316-317
354	Ziff Davis Magazine Network	300-301

* No Reader Service #. Please Call Advertiser For Information.

Advertisers' Index PRODUCTS

Reader Service No.	Company	Product	Page
ACCOUNTING SOFTWARE			
393	Peachtree Software	Accounting Software	72
ADD-ON BOARDS			
015	Bulldog Computer Products	Mail Order, Peripherals, Hardware	374
176	Diamond Computer Systems, Inc.	Stealth 64	98
391/138	H Co Memory Upgrades	Memory, PCMCIA	383
357	TC Computers	Mail Order	361
ANTI-VIRUS SOFTWARE			
894	Cheyenne Software	Inoculan	NE12
AUDIO BOARDS			
047	Roland Corporation	Sound Canvas Daughter Board	5
BACKUP SOFTWARE			
855	Micro Solutions Computer Products	Tape Backup	245
BRIDGES/ROUTERS/GATEWAYS			
872	Combinet	Bridges/Routers	NE15
CAD/CAM			
025	American Small Business Computers	DesignCAD 2D for Windows	381
358	Intergraph Corp	Microstation	164
CD-ROM			
015	Bulldog Computer Products	Mail Order, Peripherals, Hardware	374
300	Computability	Mail Order	326-327
158	Computer Library	Computer Select	170
322	Corel Corporation	Ventura	51
020	Corel Corporation	CD Combo	145
011	Corel Corporation	Photo Paint	265
027	Insight Direct, Inc.	CD ROM	422
855	Micro Solutions Computer Products	CDROM	245
357	TC Computers	Mail Order	361
343	ValueLine	Mail Order, Peripherals	379
CHIPS/PROCESSORS			
391/138	H Co Memory Upgrades	Memory, PCMCIA	383
*	Intel Corporation	Intel Overdrive	222-225
019	LA Trade	Memory	356
COMMUNICATIONS SOFTWARE			
862	Microcom	Modems	55
933	Microcom	LANExpress	NE29
858	NOTIS Systems, Inc.	Graphical User Interface	384
060	Ocean Isle Software	Reach Out Remote Control	297
936	Smith Micro Software, Inc.	Hot Desk	NE19
892	Triton Technologies Inc.	Co-Session for Windows	NE10
COMPUTERS/COMPATIBLES			
034	Acer America	PC's and Notebooks	81-85
*	AMBRA COMPUTER CORPORATION	Pentium Desktops and Notebooks	108-109
*	AMBRA COMPUTER CORPORATION	Pentium Desktops and Notebooks	218-219
336	Arlington Computer Products	Mail Order, Peripherals	347-349
*	AST Research	Pentium Desktop Computers	90-91
012	Austin Direct	Austin Desktops and Notebooks	125-127
325	Austin Direct	Austin Desktops & Notebooks	351
*	Compaq Computer Corporation	Aero	117
137	Compaq Computer Corporation	Deskpro XL	240-241
126	CompuAdd	CP60, CP90	76-77
144	CompUSA Direct	Mail Order	268-269
159	COMPUTER DISCOUNT WAREHOUSE	Hardware	338-339
109	COMPUTER DISCOUNT WAREHOUSE	Hardware	340-341
*	DEE ONE SYSTEMS	Systems	376
*	Dell Computer Corporation	Dell Systems	C5-C8
*	Dell Computer Corporation	Dell Systems	322-323
*	Digital Equipment Corporation	Systems	313
305	ExpoTech/VTech	486DX2 50 Mhz, 486SX 25 Mhz	366-369
*	Gateway 2000	Pentium PCs	49
*	Gateway 2000	PCs	48a-1
083	General Electric/Rental	Systems - Rental & Lease	122-123
*	Hewlett Packard	HP Vectra PCs	58-59
*	Hewlett Packard	HP Vectra PCs	96-97
*	Hewlett Packard	HP File Servers	213-215
*	IBM Corporation	Thinkpad & Valuepoint Systems	148-152
052	Inmac	Systems	189
027	Insight Direct, Inc.	Mail Order Systems	422
370	Micron Computer, Inc.	Micron PCs	70-71
119	Micron Computer, Inc.	Micron PCs	102-106
114	MIDLAND COMPUTER MART	Systems	354
010	Midwest Computer Works	PCs, Hardware	360
398	Midwest Micro	Desktop Systems	328-335
082	PCs Complete	Mail Order	370-371
268	PCs Complete	Mail Order	372-373
006	Targem Systems Corporation	Desktop Computers	119
379	Toshiba America	Notebook Computers	178-179
065	USA Flex	Desktop PCs	362-363
210	USA Flex	Desktop PCs	364-365
343	ValueLine	Mail Order, Peripherals	379
*	Zenith Data Systems	Z-Stor	110-111
*	Zenith Data Systems	Z-NoteFlex/Multimedia	132-133
038	Zoss Int'l	AMBRA	92
125	Zoss Int'l	Pentium Awards	161
151	Zoss Int'l	Mendian	195-198
DATA BASE MANAGERS			
287	Borland International	Paradox for Windows 5.0	6
220	Borland International	DBase	63-67
*	Oracle Corp	Workgroup Server	NE4
026	Personics	Monarch	290
DATA CARTRIDGES/FLOPPY DISKS			
094	Hi Tech Components	Hard Drives	350
DESK TOP PUBLISHING			
105	Frame Technology	FrameMaker	279

Reader Service No.	Company	Product	Page
DISK BACKUP & TAPE DRIVES			
810	3M Data Storage Products	3M Data Storage Products	101
300	Computability	Mail Order	326-327
018	MegaHaus	Drives/Storage	355
855	Micro Solutions Computer Products	Tape Backup & Disk Drives	245
343	ValueLine	Mail Order, Peripherals	379
DISPLAYS/MONITORS			
226	ADI Systems Inc.	Monitors	230-231
015	Bulldog Computer Products	Mail Order, Peripherals, Hardware	374
144	CompUSA Direct	Mail Order	268-269
329	CTX International	Monitors	239
*	DEE ONE SYSTEMS	Monitors/Peripherals	376
371	Goldstar	1520 & 1725 Monitors	18
067	Mag Innovation	Monitors	206-207
010	Midwest Computer Works	Monitors, Hardware	360
280	Mitsubishi Display Products	Monitors	252
283	Nano Corporation	Monitors	203
032	Nissan Sangyo America	Monitors	201
*	Nokia	Multigraphics Series Monitors	217
006	Phillips	Brilliance Cyberscreen Monitor	210-211
246	Phillips	Brilliance Monitors	243
046	Samsung Information Systems	Monitors	190
343	ValueLine	Mail Order, Peripherals	379
118	View Sonic	Monitors	244
FAX SOFTWARE			
868	Cheyenne Software	FaxServe	NE7
FAX MODEM			
144	CompUSA Direct	Mail Order	268-269
136	Hayes Microcomputer Products	Optima Modems	157
284	Plustek, Inc.	Scanix	256
GRAPHICS SOFTWARE			
292	Caere Corporation	OmniPage	41
283	Nano Corporation	Monitors	203
858	NOTIS Systems, Inc.	Graphical User Interface	384
375	Publishers Toolbox	Graphics Products	375
*	ShapeWare	Visio	234-235
373	Visual Software	Visual Reality	261
HAND-HELD PC'S			
*	Sharp Electronics Corp	Wizard	13
HARD DRIVES			
300	Computability	Mail Order	326-327
*	DEE ONE SYSTEMS	Hard Drives	376
094	Hi Tech Components	Hard Drives	350
*	IBM Corporation	Options/Hard Drives	255
027	Insight Direct, Inc.	Hard Drives	422
018	MegaHaus	Drives/Storage	355
855	Micro Solutions Computer Products	Disk Drives	245
357	TC Computers	Mail Order	361
HARDWARE			
*	Canon Computer Systems	Canon Printers	281
052	Inmac	Systems	189
106	Kingston Technology	Micro Channel Upgrades	302
018	MegaHaus	Drives/Storage	355
398	Midwest Micro	Notebooks, PCs, Peripherals	328-335
199	PC Zones	Mail Order	358-359
006	Phillips	Brilliance Cyberscreen Monitor	210-211
246	Phillips	Brilliance Monitors	243
IMAGE EDITING SOFTWARE			
230	Micrografix	Designer	273
INPUT DEVICES			
200	FTG Data Systems	Input/Output Devices	4
INTEGRATED SOFTWARE			
*	Lotus Development Corporation	SmartSuite	181-186
LAPTOPS/PORTABLE COMPUTERS			
034	Acer America	PC's and Notebooks	81-85
*	AMBRA COMPUTER CORPORATION	Pentium Desktops and Notebooks	108-109
*	AMBRA COMPUTER CORPORATION	Pentium Desktops and Notebooks	218-219
270	AMS	Notebooks	129
235	AMS	Notebooks	377
*	AST Research	Notebook Computers	20-21
012	Austin Direct	Austin Desktops and Notebooks	125-127
325	Austin Direct	Austin Desktops & Notebooks	351
*	Compaq Computer Corporation	Aero	117
137	Compaq Computer Corporation	Deskpro XL	240-241
144	CompUSA Direct	Mail Order	268-269
159	COMPUTER DISCOUNT WAREHOUSE	Laptops	338-339
109	COMPUTER DISCOUNT WAREHOUSE	Laptops	340-341
369	CTX International	Notebooks	158-159
*	Dell Computer Corporation	Dell Systems	C5-C8
*	Dell Computer Corporation	Dell Portables	167-169
*	Digital Equipment Corporation	Systems	313
090	Everex Computer Systems	Everex STEP Note	89
305	ExpoTech/VTech	Notebooks	366-369
089	FOSA Computer Inc	Portables	382
*	Gateway 2000	Notebooks	49
*	Gateway 2000	Notebooks	48a-1
083	General Electric/Rental	Systems - Rental & Lease	122-123
*	IBM Corporation	Thinkpad & Valuepoint Systems	148-152
114	MIDLAND COMPUTER MART	Laptops	354
010	Midwest Computer Works	PCs, Hardware	360
398	Midwest Micro	Notebooks	328-335
177	MPC Technology, Inc	Multimedia Notebooks	94
045	NEC Technologies	Versa S	28-27
081	Sunshine Computers	Notebooks/Laptops	357
368	Texas Instruments	TI TravelMate Notebooks	227
379	Toshiba America	Notebook Computers	178-179

Advertisers' Index PRODUCTS

Reader Service

No.	Company	Product	Page
065	USA Flex	Notebooks	362-363
210	USA Flex	Notebooks	364-365
085	WinBook Computer Corporation	Winbook	163
•	Zenith Data Systems	Z-Stor	110-111
•	Zenith Data Systems	Z-Noteflex/Multimedia	132-133
063	Zeos Int'l	Freestyle/Contenda	33
155	Zeos Int'l	Pentium Notebooks	137-142
125	Zeos Int'l	Pentium Awards	161
151	Zeos Int'l	Mendian	195-198

LOCAL AREA NETWORKING

300	Computability	Mail Order	326-327
075	Computer Associates	Unicenter	2-3
159	COMPUTER DISCOUNT WAREHOUSE	Networking Products	338-339
109	COMPUTER DISCOUNT WAREHOUSE	Networking Products	340-341
062	Microcom	Modems	55
093	Microcom	LANExpress	NE29
114	MIDLAND COMPUTER MART	Software/Hardware/Components	354
950	Novell, Inc.	NetWare 4.02	NE22-NE23
890	Novell, Inc.	NetWare Connect	NE30
867	Performance Technology	POWERlan 3.0	NE14
929	Proton Inc.	Network Interface Cards	NE13
892	Tinton Technologies Inc.	Co-Session for Windows	NE10
864	Wollongong Group	Access 3.0	NE24
•	Zenith Data Systems	Z-Stor	110-111
•	Zenith Data Systems	Z-Noteflex/Multimedia	132-133

MAIL ORDER

034	Acer America	PC's and Notebooks	81-85
•	AMBRA COMPUTER CORPORATION	Pentium Desktops and Notebooks	108-109
•	AMBRA COMPUTER CORPORATION	Pentium Desktops and Notebooks	218-219
025	American Small Business Computers	DesignCAD 2D for Windows	381
270	AMS	Notebooks	129
235	AMS	Notebooks	377
336	Arlington Computer Products	Mail Order, Peripherals	347-349
012	Austin Direct	Austin Desktops and Notebooks	125-127
325	Austin Direct	Austin Desktops & Notebooks	351
015	Buildog Computer Products	Mail Order, Peripherals, Hardware	374
•	Compaq Computer Corporation	Aero	117
126	CompuAdd	CP80, CP90	76-77
144	CompUSA Direct	Mail Order	268-269
•	Digital Equipment Corporation	Systems	313
305	ExpoTech/VTech	486DX/50 Mhz, 486SX/25 Mhz	366-369
014	First Source International	Memory, Software, Peripherals	352-353
•	Gateway 2000	Mail Order	49
•	Gateway 2000	Mail Order	48a-1
391/138	H Co Memory Upgrades	Memory, PCMCIA, Fax/Modems, LAN	383
•	IBM Corporation	Thinkpad & Valuepoint Systems	148-152
052	Inmac	Systems	189
027	Insight Direct, Inc.	Mail Order Systems	422
242	Kenosha Computer Center	Mail Order	378
018	MegaHaus	Drives/Storage	355
010	Midwest Computer Works	Reseller, Mail Order, Hardware	360
•	PC Connection	Mail Order	343-345
199	PC Zones	Mail Order	358-359
032	PCs Complete	Mail Order	370-371
268	PCs Complete	Mail Order	372-373
867	Performance Technology	POWERlan 3.0	NE14
375	Publishers Toolbox	Mail Order	375
008	Tagram Systems Corporation	Desktop Computers	119
357	TC Computers	Mail Order	361
065	USA Flex	Notebooks/PCs/Peripherals	362-363
210	USA Flex	Notebooks/PCs/Peripherals	364-365
343	Valueline	Mail Order, Peripherals	379
063	Zeos Int'l	Freestyle/Contenda	33
038	Zeos Int'l	AMBRA	92
125	Zeos Int'l	Pentium Awards	161
151	Zeos Int'l	Mendian	195-198

MASS STORAGE

300	Computability	Mail Order	326-327
224	Conner Peripherals	Tapestor/SONY 420	174
094	Hi Tech Components	Hard Drives	350
018	MegaHaus	Drives/Storage	355
•	Seagate Technology	Hard Drives	36

MEMORY

014	First Source International	Memory, Software, Peripherals	352-353
391/138	H Co Memory Upgrades	Memory	383
106	Kingston Technology	Micro Channel Upgrades	302
019	L.A. Trade	Memory	356

MISCELLANEOUS

•	Ziff Davis Corporate Marketing	Ziff Davis TV	316-317
354	Ziff Davis Magazine Network	Ziff Davis Magazine Network	300-301

MODEMS

300	Computability	Mail Order	326-327
138	Hayes Microcomputer Products	Optima Modems	157
862	Microcom	Modems	55
866	US Robotics Inc.	Sportster v. 34	23
920	US Robotics Inc.	Shared Access	NE21

MULTI-MEDIA

322	Corel Corporation	Ventura	51
020	Corel Corporation	CD Combo	145
011	Corel Corporation	Photo Paint	265
086	Creative Labs	AWE 32	34-35
027	Insight Direct, Inc.	Multimedia	422
177	MPC Technology, Inc.	Multimedia Notebooks	94
047	Roland Corporation	Sound Canvas Daughter Board	5
399	Sigma Designs, Inc.	Video Capture Board	425

MULTIMEDIA SOFTWARE

011	Corel Corporation	Photo Paint	265
373	Visual Software	Visual Reality	261

Reader Service

No.	Company	Product	Page
NETWORK INTERFACE CARDS			
•	3 Com Corporation	Etherlink Tasking Adapters	246-247
•	3 Com Corporation	Etherlink Tasking Adapters	249
376	3 Com Corporation	Etherlink Tasking Adapters	251
882	Intel Corporation	Flash C Adapter	NE2-NE3
829	Proton Inc.	Network Interface Cards	NE13
357	TC Computers	Mail Order	361

NETWORKING SOFTWARE

254	Artisoft Inc.	LANtastic Champagne StarterKit	146
868	Cheyenne Software	FaxServe	NE7
894	Cheyenne Software	Inoculan	NE12
075	Computer Associates	Unicenter	2-3
•	IBM PC Corporation	Market Views	16-17
877	NetManage, Inc.	Chameleon 4.0	NE11
•	Oracle Corp.	Workgroup Server	NE4
867	Performance Technology	POWERlan 3.0	NE14

OCR PRODUCTS

284	Plustek, Inc.	Scanix	258
-----	---------------	--------	-----

ON LINE DATABASE

050	Delphi Internet Services	Internet Mail Gateway	86
858	NOTIS Systems, Inc.	Graphical User Interface	384

OPERATING SYSTEMS

950	Novell, Inc.	NetWare 4.02	NE22-NE23
890	Novell, Inc.	NetWare Connect	NE30

OPTICAL PERIPHERALS

098	Pinnacle Micro	Optical Drives	337
-----	----------------	----------------	-----

ORGANIZATIONS/SERVICES

354	Ziff Davis Magazine Network	Ziff Davis Magazine Network	300-301
-----	-----------------------------	-----------------------------	---------

PC ACCESSORIES

855	Micro Solutions Computer Products	Tape Backup, CDROM, Disk Drives	245
-----	-----------------------------------	---------------------------------	-----

PC DIRECT

025	American Small Business Computers	DesignCAD 2D for Windows	381
235	AMS	Notebooks	377
336	Arlington Computer Products	Mail Order, Peripherals	347-349
325	Austin Direct	Austin Desktops & Notebooks	351
015	Buildog Computer Products	Mail Order, Peripherals, Hardware	374
300	Computability	Mail Order	326-327
159	COMPUTER DISCOUNT WAREHOUSE	Hardware/Peripherals/Laptops	338-339
109	COMPUTER DISCOUNT WAREHOUSE	Hardware/Peripherals/Laptops	340-341
305	ExpoTech/VTech	486DX/50 Mhz, 486SX/25 Mhz	366-369
014	First Source International	Memory, Software, Peripherals	352-353
089	FOSA Computer Inc.	Portables	382
391/138	H Co Memory Upgrades	Memory, PCMCIA, Fax/Modems, LAN	383
094	Hi Tech Components	Hard Drives	350
027	Insight Direct, Inc.	Mail Order Systems	422
242	Kenosha Computer Center	Mail Order	378
019	L.A. Trade	Memory	356
018	MegaHaus	Drives/Storage	355
114	MIDLAND COMPUTER MART	Software/Hardware/Components	354
010	Midwest Computer Works	Reseller, Mail Order, Hardware	360
398	Midwest Micro	Notebooks, PCs, Peripherals	328-335
•	PC Connection	Mail Order	343-345
199	PC Zones	Mail Order	358-359
092	PCs Complete	Mail Order	370-371
268	PCs Complete	Mail Order	372-373
375	Publishers Toolbox	Mail Order	375
081	Sunshine Computers	Notebooks/Laptops	357
357	TC Computers	Mail Order	361
065	USA Flex	Notebooks/PCs/Peripherals	362-363
210	USA Flex	Notebooks/PCs/Peripherals	364-365
343	Valueline	Mail Order, Peripherals	379

PCMCIA

934	Adaptec	SCSI Adapter	NE17
014	First Source International	Memory, Software, Peripherals	352-353
391/138	H Co Memory Upgrades	Fax/Modems, Flash, SRAM, Drives	383

PERIPHERAL SHARING DEVICE

•	Hewlett Packard	HP Jet Direct	78
899	QMS	Crownjet Color Printer	NE26
150	SmartPrint/Dresselhaus	Smart Print	242

PERIPHERALS

159	COMPUTER DISCOUNT WAREHOUSE	Peripherals	338-339
109	COMPUTER DISCOUNT WAREHOUSE	Peripherals	340-341
086	Creative Labs	AWE 32	34-35
•	DEE ONE SYSTEMS	Monitors/Peripherals	376
014	First Source International	Memory, Software, Peripherals	352-353
•	Gateway 2000	Peripherals	49
•	Gateway 2000	Peripherals	48a-1
•	IBM Corporation	Parts and Service	173
027	Insight Direct, Inc.	Peripherals	422
114	MIDLAND COMPUTER MART	Peripherals	354
398	Midwest Micro	Peripherals	328-335
008	Phillips	Brilliance Cyberscreen Monitor	210-211
246	Phillips	Brilliance Monitors	243
375	Publishers Toolbox	Peripherals	375
884	QMS	Magicolor Laser Printers	NE9

POWER PROTECTION

162	American Power Conversion	Power Manager	53
080	PC Power & Cooling	PowerProtection/Cooling Devices	100

PRESENTATION SOFTWARE

•	Microsoft	Microsoft Office	C2-C4,p1
•	Software Publishing	Solsace/Harvard Graphics 3.0	267

PRINTER ACCESSORIES

150	SmartPrint/Dresselhaus	Smart Print	242
-----	------------------------	-------------	-----

Advertisers' Index PRODUCTS

Reader Service No.	Company	Product	Page
065	USA Flex	Peripherals/Printers	362-363
210	USA Flex	Peripherals/Printers	364-365
PRINTERS			
*	Canon Computer Systems	Canon Printers	281
300	Computability	Mail Order	326-327
116	Hewlett Packard Peripheral Group	HP DeskJet	24-25
884	QMS	Magicolor Laser Printers	NE9
899	QMS	Crownjet Color Printer	NE26
001	Tektronix Inc.	Phaser 220 Color Printers	43
065	USA Flex	Printers	362-363
210	USA Flex	Printers	364-365
PROJECT MANAGEMENT			
075	Computer Associates	CA-SuperProject 3.0	2-3
148	Primavera Systems	Project Management	45
REMOTE COMPUTING			
060	Ocean Isle Software	Reach Out Remote Control	297
892	Triton Technologies Inc.	Co-Session for Windows	NE10
866	US Robotics Inc.	Sportstar v. 34	23
920	US Robotics Inc.	Shared Access	NE21
RENTALS/LEASING			
083	General Electric/Rental	Systems - Rental & Lease	122-123
RESELLERS			
159	COMPUTER DISCOUNT WAREHOUSE	Reseller	338-339
109	COMPUTER DISCOUNT WAREHOUSE	Reseller	340-341
010	Midwest Computer Works	Resellers	360
SCANNERS			
*	Epson America	1200C Scanner	10-11
284	Plustek, Inc.	Scanfx	256
SERVERS			
308	Compaq Computer Corporation	Proliant	74-75
*	Hewlett Packard	HP File Servers	213-215
*	IBM PC Corporation	Market Views	16-17
*	Zenith Data Systems	Z-Stor	110-111
*	Zenith Data Systems	Z-Noteflex/Multimedia	132-133
SERVICE/SUPPORT			
*	IBM Corporation	Parts and Service	173
SOFTWARE			
025	American Small Business Computers	DesignCAD 2D for Windows	381
300	Computability	Mail Order	326-327
014	First Source International	Memory, Software, Peripherals	352-353
027	Insight Direct, Inc.	Software	422
358	Intergraph Corp.	Microstation	164
*	Microsoft	Microsoft Office	C2-C4,p1
060	Ocean Isle Software	Reach Out Remote Control	297
199	PC Zones	Mail Order	358-359
383	Peachtree Software	Accounting Software	72
148	Primavera Systems	Project Management	45
043	SPSS, Inc.	Statistical & Windows Software	380
373	Visual Software	Visual Reality	261
SPREADSHEET/TEMPLATES			
*	Microsoft	Microsoft Office	C2-C4,p1
STATISTICAL SOFTWARE			
043	SPSS, Inc.	Statistical Software	380
057	StatSoft	Statistical Software	57
TCP/IP			
877	NetManage, Inc.	Chameleon 4.0	NE11
864	Wellongong Group	Access 3.0	NE24
TOKEN RING ADAPTERS			
106	Kingston Technology	Micro Channel Upgrades	302
UTILITIES			
936	Smith Micro Software, Inc.	Hot Disk	NE19
334	Symantec Corporation	Norton Utilities	28
892	Triton Technologies Inc.	Co-Session for Windows	NE10
VIDEO GRAPHICS BOARDS			
178	ATI Technologies Inc.	Graphics Xpressions	275
300	Computability	Mail Order	326-327
*	DEE ONE SYSTEMS	Video Cards	376
176	Diamond Computer Systems, Inc.	Stealth 64	90
399	Sigma Designs, Inc.	Video Capture Board	425
WINDOWS SOFTWARE			
025	American Small Business Computers	DesignCAD 2D for Windows	381
075	Computer Associates	CA-SuperProject 3.0	2-3
358	Intergraph Corp.	Microstation	164
*	Lotus Development Corporation	SmartSuite	181-186
230	Micrografix	Designer	273
*	Microsoft	Windows Trademark	60
*	Microsoft	Microsoft Office	C2-C4,p1
858	NOTIS Systems, Inc.	Graphical User Interface	384
383	Peachtree Software	Accounting Software	72
375	Publishers Toolbox	Windows Products	375
*	ShapeWare	Visio	234-235
043	SPSS, Inc.	Windows Software	380
057	StatSoft	Statistical Software	57
334	Symantec Corporation	Norton Utilities	28
892	Triton Technologies Inc.	Co-Session for Windows	NE10
373	Visual Software	Visual Reality	261
*	WordPerfect Corporation	WP Groupware	14-15
WORKSTATIONS			
048	Intergraph Corp.	Personal Workstations	277
*	Zenith Data Systems	Z-Stor	110-111
*	Zenith Data Systems	Z-Noteflex/Multimedia	132-133

For Additional Categories See MARKETPLACE PRODUCT INDEX page 387.



Coming Up

Connecting to the Internet

The Internet offers a world of new possibilities—but it's complex. We help you unravel its arcana: How to connect via dial-up or directly through your network; how to send Internet mail from the popular on-line services, and more. We also compare nine of the most popular graphical front-end packages to help you choose the easiest and most efficient way to start cruising.

Serving Up Files with Speed

We put 15 NetWare file servers through their paces. Using our newest benchmark test, NetBench, Version 3.0, and our 60-node test bed, we looked for servers that could meet the demands of a midsize network and still have capacity to spare. We'll tell you which ones were up to the task—and which couldn't handle the load.

SQL Database Servers

PC-based client/server SQL has come a long way since our last wrap-up, as *PC Magazine's* third annual SQL database shootout reveals. Stability and performance have increased dramatically, while engine feature sets show a clear trend towards convergence. But there are still plenty of differences in company strategy, performance, and price. We torture-test six SQL database servers for the Intel platform to find the ones you can really bet your business on. We also preview upcoming server releases from Borland, Computer Associates, Gupta, and IBM that may change this highly competitive landscape over the next few months.

Ethernet Switches

Your LAN's performance has been getting worse. You've already tried segmenting, but your network is still gasping for bandwidth. Before you move to an expensive high-speed solution, consider a switching hub. With an Ethernet switch, you can keep virtually all of your current investment in network hardware and software: Just plug in the switching hub and voilà, more bandwidth! We review ten switches, both with and without high-speed ports for fat pipelines to your servers.

Adding Audio

Anyone who designs databases knows how important it is to anticipate the mistakes users will make and provide appropriate error messages. Now you can make those messages verbal! Corporate Developer shows you how to add digital audio to your Windows database interface to provide talking error messages.

Editorial Product Index

Reader Service

No.	Product	Company	Page
446	Aberdeen Super P90 VLPCI	Aberdeen Inc.	118
485	AcerView 76i	Acer America Corp.	202
447	ACMA P90 PCI	ACMA Computers Inc.	121
535	Action! for Windows, Version 3.0	Macromedia Inc.	260
486	Addonics 172 GLR	Addonics	212
410	After Dark, Version 3.0	Berkeley Systems Inc.	62
431	Aldus FreeHand 4.0 for Windows	Aldus Corp.	42
489	Altima V-Scan 80	Altima Systems Inc.	216
448	AMAX 90MHz PowerStation	AMAX Engineering Corp.	121
449	Ambra TP90PCI	Ambra Computer Corp.	128
490	Amdek AM/817E	Amdek	216
952	Annex Software, Release 9.0	Xylogics Inc.	NE25
491	Apple Multiple Scan 17 Display	Apple Computer Inc.	216
450	ARES Pentium Pro 90	ARES Microdevelopment Inc.	136
451	AST Premia GX P/90 Model 733C	AST Research Inc.	136
536	Astound for Windows, Version 1.5	Gold Disk Inc.	264
492	ASTVision 7L	AST Research Inc.	220
452	AT&T Globalyst 600	AT&T Global Information Solutions	136
407	Audio15	Tatung Company of America Inc.	61
429	Avantos Review Writer	Avantos Performance Systems Inc.	37
453	Axik Ace Power 586-90PCI	Axik Computer Inc.	143
537	Bravo!, Version 2.0	Alpha Software Corp.	266
512	Brilliance 1720	Philips Consumer Electronics Co.	248
454	CAF Lightning P9	CAF Technology Inc.	143
413	Carbon Copy for Windows, Version 2.5	Microcom Inc.	68
954	Channels, Version 1.1	TEAM Software	NE27
528	The Columbia Granger's World of Poetry	Columbia University Press	423
538	Compel, Version 1.0a	Asymetrix Corp.	271
432	ComScan	Command Communications Inc.	48
455	Comtrade Professional P5/90	Comtrade	147
961	CorStream, Version 1.0	Artisoft Inc.	NE16
955	CruiseLAN/Access Point	Zenith Data Services	NE27
955	CruiseLAN/ISA	Zenith Data Services	NE27
955	CruiseLAN/PCMCIA	Zenith Data Services	NE27
494	CTX 1765GM, 1785GM	CTX International Inc.	220
415	DacEasy Accounting Five	DacEasy Inc.	69
415	DacEasy Order Entry Five	DacEasy Inc.	69
415	DacEasy Payroll Five	DacEasy Inc.	69
415	DacEasy Point of Sale Five	DacEasy Inc.	69
534	D-Day Multimedia Encyclopedia	Context Systems Inc.	427
456	Dell Dimension XPS P90	Dell Computer Corp.	147
457	Diamond DT 586-90	Diamond Technologies Inc.	153
503	Diamond Scan 17FS	Mitsubishi Electronics America Inc.	233
433	DocuComp for Windows, Version 3.0	Mastersoft Inc.	48
444	The Elements of E-mail Style	Addison-Wesley	73
427	Employee Appraiser, Version 2.0	Austin-Hayne Corp.	37
458	EPS P90 Explorer	EPS Technologies Inc.	154
513	ErgoView 170	Sigma Designs Imaging Systems Inc.	248
443	Essential Comm, Version 5.0	Lifeboat Publishing	299
956	FastBridge 1200	FastLan Solutions Inc.	NE27
956	FastGroup 4000, 8000	FastLan Solutions Inc.	NE27
441	Fax Plus, Version 1.07	EliTech Development Inc.	299
962	FaxWorks OS/2 LAN, Version 1.39	SofNet Inc.	NE6
459	FCS Green Pentium 90	First Computer Systems Inc.	155
539	Freelance Graphics for OS/2, Release 2.1	Lotus Development Corp.	272
539	Freelance Graphics for Windows, Release 2.01	Lotus Development Corp.	272
406	FreeMail Extended Family	Saroff Design	61
460	FutureTech System 5490P	FutureTech Systems Inc.	155
461	Gateway 2000 P5-90	Gateway 2000 Inc.	155
412	Golden Sound Pro 16 Plus	Toptek Technology Inc.	62
496	Goldstar Model 1725	Goldstar USA Inc.	221
529	Great Poetry Classics	World Library Inc.	423
540	Harvard Graphics 2.0 for Windows	Software Publishing Corp.	276
404	Harvard Spotlight for Windows	Software Publishing Corp.	61
462	Hewitt Rand HR P5-90 Panther	Hewitt Rand Corp.	156
405	HotDocs, Version 2.0	Capsoft Development Corp.	61
463	HP Vectra XU 5/90C	Hewlett-Packard Co.	160
497	Hyundai HL-7682A	Hyundai Electronics America	221
498	IBM 17P	IBM Personal Computer Co.	226
499	IDEK/Iiyama VisionMaster MF-8617	IDEK/Iiyama North America Inc.	226
500	Ikegami CT-17A	Ikegami Electronics Inc.	228
464	Initiative Technology ITI 590 Pi	Initiative Technology Inc.	160
465	Insight PCI P90 SCSI	Insight Direct Inc.	162
442	InstantCom//CAS	Instant Information Inc.	299
953	LanRover, Version 3.0	Shiva Corp.	NE25
418	Lotus Forms, Release 1.0	Lotus Development Corp.	44
966	Lotus Notes VIP for Windows, Version 1.0	Lotus Development Corp.	NE22
430	Lotus 1-2-3 for Windows, Release 5	Lotus Development Corp.	37
501	MAG DX17F, MXP17F	MAG InnoVision Inc.	229
445	Managing Internetworks with SNMP	M&T Books	73
419	Maxmedia CX/24 Graphics Accelerator Card	UMAX Technologies Inc.	47
466	Mega Impact P90PCI/VLB+	Mega Computer Corp.	165

467	Memorex Telex Celeria LP90	Memorex Telex Corp.	165
468	MicroFLEX-VL/Pentium/90	Micro Express	165
541	Micrografx Charisma, Version 4.0	Micrografx Inc.	280
469	Micron P90PCI PowerStation	Micron Computer Inc.	166
488	MicroScan 5EP	ADI Systems Inc.	212
542	Microsoft PowerPoint, Version 4.0	Microsoft Corp.	282
502	MiTAC Performance Series L1782	MiTAC	233
470	Mitsuba Premier System-90	Mitsuba Corp.	171
507	Multigraph 447X	Nokia Display Products Inc.	242
515	MultiScan 17se	Sony Electronics Inc.	250
504	Nanao FlexScan F550iW, F560iW	Nanao USA Corp.	237
505	NEC MultiSync 5FGc, 5FGp	NEC Technologies Inc.	238
471	NETiS N590 Pentium System	NETiS Technology Inc.	171
963	Net SatisFAXtion, Version 2.5.1	Intel Corp.	NE8
416	Noteworthy Portable Digital Video Card	Toshiba America Information Systems Inc.	69
472	Novacor Nova Pentium 90	Novacor Inc.	172
964	Object Fax Advanced, Version 3.0	Traffic Software Inc.	NE11
508	Optiquet 4000TC	Optiquet Inc.	245
473	Pactron Quake 9NSX90	Pactron Integration Computer Inc.	175
511	PanaSync C1791E	Panasonic Communications & Systems Co.	248
510	PB8517SVGIM	Packard Bell Electronics Inc.	248
426	PCMCIA Audio Card	IBM PC Direct	46
425	PCMCIA Notebook Sound Card	MediaMagic	46
414	Peachtree Accounting for Windows, Release 3.0	Peachtree Software	68
428	Performance Now!	KnowledgePoint	37
401	PhotoGenix	Firefly Software Corp.	52
530	Poem Finder 94	Roth Publishing Inc.	424
533	Poetry in Motion	Voyager	424
474	Polywell Poly 586-90VLB	Polywell Computers Inc.	175
958	POWERfusion, Version 2.2	Performance Technology	NE28
951	PowerHub 7000	Alantec Corp.	NE25
402	Power Utility Pak	Jwalk and Associates Inc.	52
514	PrecisionColor Display/17	Radius Inc.	250
421	QAPLus/WIN, Version 6.0	DiagSoft Inc.	56
493	QVision 172	Compaq Computer Corp.	220
420	Rexham Presentation InkJet Series	Rexham Graphics	61
420	Rexham Presentation Thermal Transfer Series	Rexham Graphics	61
475	Royal Media Master IV	Royal Electronic Inc.	175
531	Same & Different	American Education Publishing	424
517	Sceptre CL-617GL+	Sceptre Technologies Inc.	251
409	Sherlock, Version 4.0	2010 Software Corp.	62
476	Sidus SCI9P590PDT	Sidus Systems Inc.	176
439	SmarTex, Release 3	Lotus Development Corp.	54
960	SnapLAN	ADC Fibermux Corp.	NE18
477	Solmicro Arena PV190	Solmicro Inc.	177
532	Strike Commander CD	Origin Systems Inc.	427
487	SuperMatch 17 XL	SuperMac Technology Inc.	212
506	SuperScan Elite 17	Nissei Sangyo America/Hitachi	238
516	SyncMaster 17GL, 17GLs	Samsung Electronics America Inc.	250
478	Sys Performance Pentium 90 Full Tower	Sys Technology Inc.	177
479	Tagram Thunderbolt P90, PCI 90	Tagram System Corp.	177
480	Tangent PCI-590	Tangent Computer Inc.	187
518	Tatung Omniscan CM17MKR	Tatung Co. of America Inc.	253
437	TEAC SuperQuad 4X AT CD-ROM Drive	TEAC America Inc.	40
436	Teleform for Windows, Version 3.0	Cardiff Software Inc.	50
438	TelevEyes/Plus	Digital Vision Corp.	40
424	Tempo	I/O Magic	46
957	ThunderLAN	Compaq Computer Corp. / Texas Instruments Inc.	NE28
481	Tri-CAD Vigor Pentium-90	Tri-Star Computer	187
509	The Tuba	Orchestra MultiSystems Inc.	248
495	ViewMagic CA-1765SPL	ETC Computer Inc.	221
519	ViewSonic 17 & 17G	ViewSonic	254
959	Virtual On-site Technology	CrossCom Corp.	NE28
411	Virtuoso	PictureTel Corp.	62
417	Vista-S6 LE, Vista-S6 PRO	UMAX Technologies Inc.	69
422	VoiceLock, Version 1.04	QVoice Inc.	56
423	WAVjammer	New Media Corp.	46
520	Wen JK1775 Digital Color Control Monitor	Wen Technology Corp.	254
434	WinEst, Version 2.1	WinEstimator Inc.	48
965	WinFax PRO for Networks, Version 3.0	Delrina Corp.	NE14
435	WordPerfect Envoy	WordPerfect/Novell Applications Group	50
543	WordPerfect Presentations, Version 2.0 for Windows	WordPerfect/Novell Applications Group	287
482	Xinetron Green Pentium 90MHz	Xinetron Inc.	187
483	Zenon Z-Titan Pentium 90MHz	Zenon Computer Systems	188
484	ZEOS Pantera 90	ZEOS International Ltd.	189

NE—Network Edition.

To obtain the Network Edition of *PC Magazine*, call Circulation at 800-289-0429.

20,000 PRODUCTS 24 HOURS A DAY.

PCI SYSTEM

A Complete PCI System
for only \$1,999

386MHz PCI Special



NETWORKING

Etherlink III BNC 3C509	115
Etherlink III BNC 5pk 3C509	490
Etherlink III BNC 20pk 3C50902	1,949
Etherlink III TP 3C50907P	119
Etherlink III TP 5pk 3C50907-S	490
Etherlink III TP 20pk 3C509120	1,900
Etherlink III Combo TP/BNC	129
Etherlink III Combo TP/BNC 5pk	539
Etherlink III EISA BNC 5pk	239
Etherlink III EISA BNC 5pk	1,049
Etherlink III EISA TP 3C579TP	239
Tokenlink III 3C619	479

Lantronic 6.0 User 3.5"	\$99
Lantronic 6.0 SL Kit BNC (2) Nodes/runner/	349
SI 2000C	159
Lantronic 6.0 Add on BNC/odeunner/	159
SI 2000C	159
Lantronic 6.0 Add on TP Nodes/runner/	159
2000T	349
Lantronic 6.0 User 3.5"	349

Ethernet+ Elite 16T	\$110
Ethernet+ Elite 16T 6 Pack	129
Thomas Conrad	
TC-4045 16bit Token Ring	\$349

Intel Ether Express 16	\$99
Intel Ether Express 16TP	105
Intel Ether Express 16TSC	129
Intel Ether Express EISA Color	429

Novell Netware V 4.01*

*Available only on CD	
5 User	\$329
50 User	3,699
100 User	4,999
250 User	9,999
1000 User	27,999

PE3-1082 Pocket Ethernet BNC	\$299
PE3-108C Pocket Ethernet Combo	299
PE3-108T Pocket Ethernet TP	299
PPX-03 Parallel Port Multiplexer	89
PT02-168T Token Ring 16/4 RJ-11	549

Kingston

Call for all products and prices.

PCMCIA CARDS

AT&T Fasmodem 14.4/14.4	\$299
14.4/14.4 PCMCIA Fasmodem XJack	\$219
96/96 PCMCIA Fasmodem XJack	189
14.4/14.4 PCMCIA Gold Fasmodem	239
Optima 14.4/14.4 PCMCIA Fasmodem	\$265
Packard 14.4/14.4 PCMCIA Fasmodem	\$275
Network combo	259
Network RJ-45	219
Network BNC	219
Workport 14.4/14.4 PCMCIA Fasmodem	199
Workport 96/24 PCMCIA Fasmodem	199

MODEMS

Optima 14.4/14.4 External Modem	\$369
Optima 14.4/14.4 External Fasmodem	379
Optima 96/96 External Fasmodem	355
Ultra 96 External Modem	559
Optima 24 External Modem	109
Acoura 24 External Modem	75
Optima 144 PCMCIA Fasmodem	265

Proclass 14.4/14.4 Internal Fasmodem	139
Proclass 14.4/14.4 External Fasmodem	149
Proclass 28.8/14.4 Internal Fasmodem	259
Proclass 28.8/14.4 External Fasmodem	399
Series II 14.4/14.4 Internal Fasmodem	109
Series II 14.4/14.4 External Fasmodem	115

Robotics

Sportster 14.4/14.4 Internal Modem	\$115
Sportster 96/96 Internal Fasmodem	125
Sportster 14.4/14.4 Int. Fasmodem	119
Sportster 28.8/28.8 Ext. Fasmodem	245
Sportster 28.8/28.8 Int. Fasmodem	225

SOFTWARE

The lowest prices on thousands of titles.

Prices and availability subject to change without notice. Heavy Price Cuts and 1-year warranty may have restrictions. Shipping is not included. All trademarks are the property of their respective owners. Typographic errors are subject to correction. Please mail any requests to Insight Direct, Inc. 974

MONITORS

17" Ink VectorMaster CMDB17	799
21" Ink 8621 CMDB21	2,295

NEC

14" MultiSync SVGA CMNEC14	\$295
15" MultiSync SV CMNEC15	459
17" MultiSync SV CMNEC17	979
21" MultiSync 8V GIP CMNEC8VGP	1,579



MAQ

15" MAG CMDX15	379
17" MAG CMDX17	679



UPS

Backup-UPS 200	\$89
Backup-UPS 400	169
Backup-UPS 600	259
Backup-UPS 900	369
Backup-UPS 1250	499
Personal SurgeArrest w/Telephone	29
Professional SurgeArrest w/Telephone	39
Network SurgeArrest w/Telephone	49

BC250

BC400	\$99
BC500LAN	199
BC750LAN	309
BC 900LAN	359
Isolator 4 outlets w/RJ11	49
Isolator 4	39

CD-ROM DRIVES

CHINON

CDS635 Bare	\$359
KIT	\$429

NEC

3rd Internal Bare	\$429
3rd External Bare	\$459
4x External Bare	\$899

PLEXTOR

Model DM-3055	
Internal bare	\$299
External bare	379
4-Plex Internal	475

TOSHIBA

Model 3401 Bare	\$359
KIT	\$429

MULTIMEDIA

CREATIVE

Sound Blaster Pro Deluxe	\$99
Sound Blaster MIDI Kit	59
Sound Blaster 16 Multi-CD	169
Sound Blaster 16CD ASP	209
Sound Blaster 16 SCSI	199
Sound Blaster Deluxe	69
Sound Blaster 16 SCSI ASP	219
Sound Blaster 16 Basic	69
Sound Blaster Pro Deluxe 8 Bit	89
SBS300 Yamaha Speaker Set	99
Video Spigot for Windows	249
Wave Blaster	349
Wave Blaster Board	189

REVEAL

MultimediaFX-01	\$279
MultimediaFX-02 - Int. drive double	
speed, 300KB transfer, 16 Bit sound,	
speakers, microphone and 8 titles...	\$349
MultimediaFX-08 - Int. drive double	
speed, 300KB transfer, 16 Bit sound,	
speakers, microphone and 35 titles...	\$579

FUJITSU

Fujitsu Int. MO 230MB (PC)	\$999
Fujitsu DynaMO 230 (Mac or PC)	999
Bernoulli 80 Pro Internal Kit	359

Bernoulli Multitask Insider 150 IDE

210MB Kit BEMD210K	\$399
505MB Kit BEMD505K	599
1050MB Kit BEMD1050K	799

REMOVABLE STORAGE

WANGDAT

4mm DAT 2GB Int. 16 Bit Kit	\$999
4mm DAT 4GB 3200 Int. 16 Bit Kit	1,049
4mm DAT 4GB 3200 Int. 16 Bit Kit	1,199
8mm Tape Cartridge	12

CONNER

250MB Internal A250	\$149
250MB External A250EP	339

EXABYTE

8mm 5.0Gig Model 8525	\$2,199
8mm 2.0Gig Model 8205	1,299
8mm Tape Cartridge	12

MEGA

Imagetape250 Internal Basic	\$159
Imagetape250 Internal Half-height	179
Imagetape250 PC Powered Ext.	299

Talon 250MB Internal

w/2 unformatted tapes TBTA250K...	\$179
w/5 formatted tapes TBTA250K5...	229
Parallel Port w/ tape TBTA/T23...	319

WangDAT

4mm DAT 2GB Int. 16 Bit Kit	\$999
4mm DAT 4GB 3200 Int. 16 Bit Kit	1,049
4mm DAT 4GB 3200 Int. 16 Bit Kit	1,199
8mm Tape Cartridge	12

CONNER

250MB Internal A250	\$149
250MB External A250EP	339

EXABYTE

8mm 5.0Gig Model 8525	\$2,199
8mm 2.0Gig Model 8205	1,299
8mm Tape Cartridge	12

MEGA

Imagetape250 Internal Basic	\$159
Imagetape250 Internal Half-height	179
Imagetape250 PC Powered Ext.	299

Talon 250MB Internal

w/2 unformatted tapes TBTA250K...	\$179
w/5 formatted tapes TBTA250K5...	229
Parallel Port w/ tape TBTA/T23...	319

WangDAT

4mm DAT 2GB Int. 16 Bit Kit	\$999
4mm DAT 4GB 3200 Int. 16 Bit Kit	1,049
4mm DAT 4GB 3200 Int. 16 Bit Kit	1,199
8mm Tape Cartridge	12

PRINTERS

Canon

BJ-10SX Portable Bubble Jet	\$249
BJ-200E Bubble Jet	289
BJ-230E Wide Carriage Bubble Jet	399
BJC-600 Color	589
LASER LBP 430	589
LASER LBP 800	1,389



EPSON

LY 300 9 pin Dot Matrix	\$169
LQ-570+ 24 pin Dot Matrix	239
DFX 5000+ High Speed	1,379
Stylus 800 Inkjet	319
Stylus 1000 Inkjet	445
Action Printer 3280 Dot Matrix	199
Stylus Color Inkjet 720 dpi	
Action 1800 6 ppm Laser	995



HEWLETT* PACKARD

DeskJet 310 Portable Ink Jet	\$289
DeskJet 520 Ink Jet	279
DeskJet 580C Ink Jet color	539
LaserJet 4L 4 ppm Laser	849
LaserJet 4P 4 ppm Laser	949
DeskJet 1200CS	1,425
DeskJet 1200PS	2,069



NEC

PE200 24 Pin	\$409
PE300 24 Pin	629
Stenwriter 1067	1,399

OKIDATA

OL110E Laser	\$829
OL1810 Laser	929
OL850 Laser	1,239
ML360 Dot Matrix	219
ML320 Dot Matrix	299
ML521 Dot Matrix	489

Panasonic

KX-P2023 Dot Matrix	195
KX-P2124 Dot Matrix	315
KX-P3824 Dot Matrix	409
KX-P4400 SideWriter	535
KX-P4430 SideWriter	589
KX-P5400 SideWriter	835

TEXAS INSTRUMENTS

MicroWriter LED 5ppm 512K	\$499
MicroWriter PS23 LED 5ppm 2MB	679
MicroWriter PS65 LED 5ppm 2MB	815
MicroWriter Pro PS23	1,349
MicroWriter Pro PS65	1,529
MicroWriter Pro	379
MicroWriter color	239

TAPE BACKUPS

COLORADO MEMORY SYSTEMS

250MB COLUMBO250	\$169
120MB COLUMBO	99
Trakster 250MB COUT20	329
Trakster 120MB COUT10	219

CONNER

250MB Internal A250	\$149
250MB External A250EP	339

EXABYTE

8mm 5.0Gig Model 8525	\$2,199
8mm 2.0Gig Model 8205	1,299
8mm Tape Cartridge	12

MEGA

Imagetape250 Internal Basic	\$159
Imagetape250 Internal Half-height	179
Imagetape250 PC Powered Ext.	299

Talon 250MB Internal

w/2 unformatted tapes TBTA250K...	\$179
w/5 formatted tapes TBTA250K5...	229
Parallel Port w/ tape TBTA/T23...	319

WangDAT

4mm DAT 2GB Int. 16 Bit Kit	\$999
4mm DAT 4GB 3200 Int. 16 Bit Kit	1,049
4mm DAT 4GB 3200 Int. 16 Bit Kit	1,199
8mm Tape Cartridge	12

HARD DRIVES

From the Mass Storage Experts.

WESTERN DIGITAL

Capacity	Interface	Model	Access	FF/Height	Bare	Kit
170MB	IDE	WDAL2170	12ms	2.5"	\$309	\$329
300MB	IDE	WDAL2250	12ms	2.5"	319	339
210MB	IDE	WD1212GA	12ms	3.5" 1H	179	199
270MB	IDE	WD1272GA	12ms	3.5" 1H	199	219
340MB	IDE	WD2342A	12ms	3.5" 1H	219	239
420MB	IDE	WD2422A	12ms	3.5" 1H	239	249
540MB	IDE	WD2542A	12ms	3.5" 1H	299	319
730MB	IDE	WD2702A	12ms	3.5" 1H	419	439
1080MB	IDE	WD31002A	10ms	3.5" 1H	579	599

CONNER

213MB	IDE	CFS210A	14ms	3.5" 1H	\$189	\$209
340MB	SCSI	CFA340S	13ms	3.5" 1H	259	359
428MB	IDE	CFA420A	14ms	3.5" 1H	239	259
540MB	IDE/SCSI	CFA540A/S	10ms	3.5" 1H	309/359	329/459
1080MB	IDE/SCSI	CFP1080A/S	9.5ms	3.5" 1H	619/719	629/819

FUJITSU

1080MB	SCSI	FJ2094S	10ms	3.5" HH	\$689	\$789
--------	------	---------	------	---------	-------	-------

Mapstor

290MB	IDE/SCSI	
340MB	IDE	
340MB	SCSI	
545MB	SCSI	

After Hours



EDITOR'S RATINGS: ★ Poor ★★ Fair ★★★ Good ★★★★★ Excellent



Poetry Software: For Better or Verse

Poetry and computers—completely different worlds, right? Not exactly. Poems have been written about computers, and computers have been used to study poetry and even to compose it. There are now three programs on CD-ROM that can help you find poems on specific topics, find that poem you know just the first line of, or even read a classic piece of poetry at your computer. These poetry programs are easy to use, come with first-rate search engines, and let you print out the data you've retrieved. All in all, they are particularly useful research tools for writing that English Lit paper.

The Columbia Granger's World of Poetry

Columbia University Press;
800-944-8648, 212-666-1000.

Circle 528 on reader service card

★★★★★ CD-ROM \$99.00

For general use, The Columbia Granger's World of Poetry is hard to beat. It

than any rival program—and this is one of its most impressive features. It includes 3,000 quotations from 1,500 other works, along with title and first-line information for 100,000 poems. These works encompass the text of *Granger's Index to Poetry, Eighth Addition*; *The Columbia Granger's Index to Poetry, Ninth Edition*; *The Columbia Dictionary of Poetry Quotations*; and *The Columbia Granger's Guide to Poetry Anthologies*. In all, the database covers

The Columbia Granger's World of Poetry includes more poems than any other package.

offers a good, representative collection of the best-known poems in English, a well-designed interface, and a powerful search engine. Though it's available only in a DOS version, it can run in a Microsoft Windows DOS box.

Granger's gives the full texts of 8,500 poems—more

15,000 poets, 550 poetry anthologies, and 4,000 subject headings, including Aardvarks, Abandonment, Abbeys, and much more.

You can search through the ample database by title, first line, author, and key word or phrase. Search strings are limited to 40 characters,

though, and search routines can be quite slow. These are just minor drawbacks of an otherwise commendable product. The main drawback is Granger's steep \$699 price tag; for occasional use, a different package might be in order. Serious poetry scholars, however, can do no better.

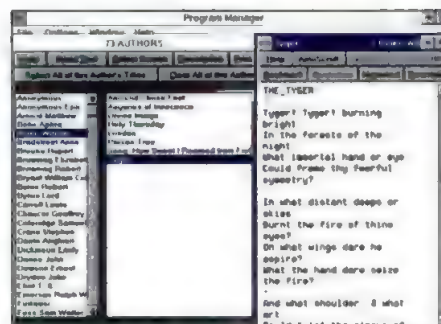
Great Poetry Classics

World Library Inc.; 800-443-0238, 714-756-9500.

Circle 529 on reader service card

★★★ CD-ROM \$49.95

For the casual poetry fan, or someone just looking for on-screen versions of old favorites, World Library's Great Poetry Classics is the disk to choose. Though this \$49.95 bargain is available in both DOS and Windows editions, the outstanding interface of the Windows version makes it the preferred choice. With the Windows version, you can use the Clipboard to move text into your own files and work with as



Great Poetry Classics features the most intuitive interface of all the poetry packages.

many as eight different poems at once. You can select the size and style of the screen fonts and, if you'd like, display stanza and line numbers for the poems. Great Poetry Classics offers another valuable feature, Autoscroll, which continuously moves the text of a poem up the screen at the speed you choose (it looks something like movie credits rolling).

The drawback of this disk is that it includes only 1,150 poems, versus Granger's 8,500. There are no poems by Swift, Hopkins, Auden, or Stevens; Marlowe, Marvell, Dryden, Pope, and Eliot are represented by only one selection each. And though the disk does credit the translators of for-

AFTER HOURS INDEX

Poetry Software

<i>The Columbia Granger's World of Poetry</i>	423
<i>Great Poetry Classics</i>	423
<i>Poem Finder 94</i>	424
CD-ROM Pick Hit	
<i>Poetry in Motion</i>	424
Pre-Reading	
<i>Same & Different...</i>	424
Quick Clips	
<i>Russian 6 Pak</i>	426

Shanghai II: Dragon's

<i>Eye</i>	426
<i>The Flintstones Screen Saver Collection</i>	426
<i>The Gospels: A Multimedia Guide to the Bible</i>	426
Adventure	
<i>Strike Commander CD</i>	427
Spotlight on History	
<i>D-Day Multimedia Encyclopedia</i>	427

After Hours

eign-language poems, the translations are not always the versions favored by poetry scholars.

Even so, Great Poetry Classics does include the full texts of some important long works, among them Homer's *Iliad*, *Beowulf*, Dante's *Inferno*, Chaucer's *Canterbury Tales*, and Byron's *Don Juan*. Having these texts available in searchable electronic form opens up interesting possibilities for analysis. For example, you could compile comprehensive lists of color images in *The Canterbury Tales*, of references to the gods in *The Iliad*, or—by searching for *like* and *as*—of similes in *Don Juan*. This capability alone is worth the price of the program.

Poem Finder 94

Roth Publishing Inc.; 800-899-7684, 516-466-3676.

Circle 530 on reader service card

★★ CD-ROM \$295.00

Unlike Granger's and Great Poetry Classics, Roth Publishing's \$295 Poem Finder 94 doesn't provide the texts of the poems it indexes: It's restricted to titles, first lines, and (for some entries) last lines. Thus you'll need to look in an anthology to follow up on the program's references, and keyword searches won't work if you remember only a random line of a poem. These limitations make the DOS-only Poem Finder more suitable for scholarly

research than for casual perusal.

Poem Finder's strength is its gargantuan database, which indexes 360,000 poems and 44,000 authors. The package draws data from 1,600 anthologies, 2,100 single-author collections, and 109 periodicals. Unlike Granger's and Great Poetry Classics, Poem Finder includes many contemporary poems and foreign poems in translation.

Along with titles and first lines, Poem Finder can locate verse by subject, author, or translator—even by author's nationality, religion, or profession. For example, the "Actresses" heading will help you discover that Katherine Hepburn once published a poem called "Thank You, Gorbachev!"

Poem Finder is unrivaled when it comes to tracking down poems on unusual topics. Granger's and Great Poetry Classics have no listings for poems about computers; Poem Finder has 10. The program can refer you to 271 poems about death and 1,760 about love. It can help you find poems about Cleopatra, Beethoven, Lenin, Elvis Presley, and Muhammad Ali. In short: If poem finding's the racket, Poem Finder can hack it.

—Rubin Rabinovitz



Though Poem Finder 94 doesn't include any poems, it is an invaluable research tool.

Poetry in Motion

If you think contemporary poetry is a rather dull business, this unique multimedia anthology may change your mind. It includes the full text of poems from 23 poets, but that's just the start. Poetry in Motion also gives you



Ntozake Shange

"Lament for an Ancestor"
(From *Lemonade, Cypress & Indigo*)

what does it mean that his father cd sing n dance?
why do we tap that to music / we dont know what we mean /
i saw what that means / good god / did i see it / i cde
walked on the water / i feel the redneck clothed
the hungry / with what dance i see today / i dont mean dance
i mean like a closer walk with shoe / a more slow sways that
fall

off in space / i mean i saw the black people move the ground
do not the more beneath the feet / so what's this means that
black father cd dance / well / how did a woman like her breathe
who say well
her body the night riders d the menage / the children
hunger
on they mother's dresses / while they father's beat to death the
blood / from the man's wounds / his woman's hair / the night
riders
gon off in the darkness / the silence of the night

As Performed As Published 41 of 38
POETRY IN MOTION

QuickTime videos of the authors reciting, ranting, or otherwise performing their works, often with musical backup. The writers—among them Allen Ginsberg, Robert Creeley, John Cage, and Ntozake Shange—were chosen as much for their striking reading styles as for the significance of their work. This means there's rarely a slow moment, even when the poetry itself isn't of the highest literary quality. Video interviews with many of the poets provide some intriguing insights into their writing. English Lit 101 was never like this.—Robert Kendall

Voyager; 800-446-2001, 914-591-5500.

Circle 533 on reader service card

★★★★ CD-ROM \$29.95

Pre-Reading

Kermit Meets His Match

Same & Different

American Education Publishing; 614-848-8866.

Circle 531 on reader service card

★★★★ CD-ROM \$19.95

Just because they can't yet read doesn't mean your little ones can't use the computer. With spoken help, colorful animations, and some very recognizable characters, Same & Different is one package that can turn your computer into a preschool classroom.



The first title in the Jim Henson's Muppets/ Brighter Child Software series, Same & Different offers pre-readers 20 activities to help them master object recognition and differentiation skills. The focus of each of these tasks is either to identify objects that are the same or to single out the one object in a group that is different. While they're matching similar objects, kids also learn important skills such as letter and word recognition and street safety.

All of the lessons are taught by some very familiar faces: the Muppets. Kermit is looking for teammates to play baseball; Miss Piggy needs help sorting through a closet of mismatched shoes, and Rowlf has to match up letters and signs.

Mom, why is
the video on
the computer so
TINY? An' how
come it's
so weird and
JERKY?

That's what they *used* to call "multimedia," Melvin.

RealMagic™ is multimedia now! Add the RealMagic card to your system for the incredible realism of smooth screen-filling, full-motion video and 16-bit audio. MPEG is the powerful new digital video and audio standard that puts the "real" in RealMagic.

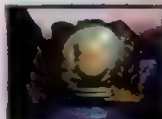
Enter the exciting new world of interactive MPEG CD-ROMs including

OLD MULTIMEDIA



"Old" Video Image

REALMAGIC



Full Motion
Full Screen • Full Sound

For the store near you or more information on RealMagic, call

1-800-845-8086

movies, games, educational titles, music videos and more. RealMagic is available as an MPEG playback card or a complete multimedia upgrade kit. Anything less is history. Get RealMagic and get real multimedia.



REALmagic

© 1994 Sigma Designs, Inc. The Sigma Designs logo is a registered trademark, and RealMagic and RealMagic are trademarks of Sigma Designs, Inc. All other brand and product names are property of their respective owners.

SIGMA DESIGNS

CIRCLE 399 ON READER SERVICE CARD

After Hours



Preschoolers can build skills by playing with their favorite Muppets in *Same & Different*.

Add a sound card to your PC and pre-readers can use this program by themselves. The directions for each activity are read aloud when a new screen appears, and sound effects indicate whether the child has chosen correctly or incorrectly. If they've forgotten what the goal of the exercise is, kids can click in the direc-



The vivid illustrations, entertaining animations, and familiar Muppet characters in *Same & Different* will keep kids amused for hours. And while they are playing with their animated friends, they'll be learning some valuable skills.

—Gayle C. Ehrenman

tion box at any time to hear the instructions again. Each correct response triggers an amusing animation sequence; incorrect responses trigger a sound effect and a prompt either to try again or to have the program display the correct answer.

QUICK CLIPS

Russian 6 Pak

Install these strategy games at your own risk: The six Russian-born beauties may look simple, but they're so addictive you'll never be able to get any work done. \$40; *Interplay Productions Inc.*; 800-969-4263, 714-553-6655.

Shanghai II: Dragon's Eye

A variant of that ancient Chinese obsession mah-jongg. But is there anyone who doesn't already own some form of this classic? \$39.95; *Activision*; 800-477-3650, 310-473-9200.

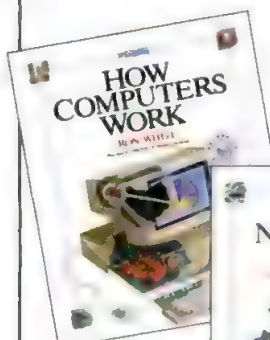
The Flintstones Screen Saver Collection

The highlight here is Pong—a Stone Age game for a Stone Age screen saver. The caveman kitsch is just not enough of an attraction. It's strictly for those who loved the movie. \$34.95; *Delrina Corp.*; 800-268-6082.

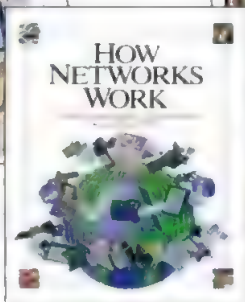
The Gospels, A Multimedia Guide to the Bible

The best-selling book of all time goes high-tech on a CD-ROM that adds video and narration to the greatest stories ever told. You can search through the full King James text of the Old and New Testaments, but not the Apocrypha. \$49.95; *Cinerom Inc.*; 714-660-7111.

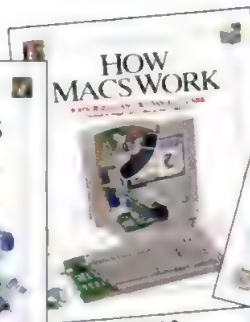
Imagination. Innovation. Insight.



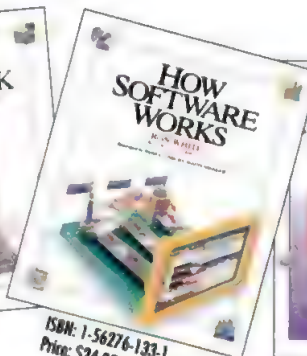
ISBN: 1-56276-094-7
Price: \$22.95



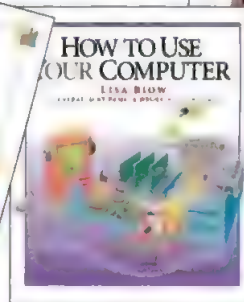
ISBN: 1-56276-129-3
Price: \$24.95



ISBN: 1-56276-146-3
Price: \$24.95



ISBN: 1-56276-133-1
Price: \$24.95



ISBN: 1-56276-155-2
Price: \$22.95



ISBN: 1-56276-166-0
Price: \$15.95

No other books bring computer technology to life like the *How It Works* series from Ziff-Davis Press. Lavish, full-color illustrations and lucid text from some of the world's top computer commentators make *How It Works* books an exciting way to explore the inner workings of PC technology.

Available at all fine bookstores or call 1-800-688-0448, Ext. 204.

© 1994 Ziff-Davis Press



Adventure

Blast Off to New Heights

Strike Commander CD

Origin Systems Inc.; 800-245-4525, 512-335-0440.

Circle 532 on reader service card

★★★★★     \$79.95

If there's any game that deserves to be on CD-ROM, it's Origin Systems' Strike Commander. A graphically dazzling adventure game/flight simulator, Strike Commander came at a high price in its original floppy-disk-based format: You couldn't run it on anything slower than a 486DX2/50, it required 41MB of hard disk space and lots of RAM, and game play was still choppy. This recently released CD-ROM version is like a new lease on life. It makes fewer technical demands, improves overall performance, and adds some speech capabilities and missions that previously were sold separately.

Like Spectrum Holobyte's complex Falcon 3.0, Strike Commander places you behind the rudder of a F-16 jet fighter. Here, though, you're soaring through a near-future world where the global economy is teetering on disaster. Mercenary squadrons, flying late-twentieth-century fighter aircraft, have become the tools of the rich and famous; the IRS has its own squadron, making audits even scarier.

You play a rough-and-ready male pilot in the ranks of Stern's Wildcats—a mercenary squadron that prides itself on accepting only ethical missions, such as delivering supplies to besieged government forces. You must complete missions and survive confrontations with

SPOTLIGHT ON HISTORY

D-Day Encyclopedia

You won't become a military historian by purchasing D-Day Multimedia Encyclopedia, but you will gain more knowledge about the Normandy invasion than you'd ever expect to receive from a single source. This enriching CD-ROM, from Context Systems, will satisfy anyone who wants to know more about one of the major world events of the twentieth century.

The main screen lets you choose to view a number of in-depth articles, all of which include bibliographical sources. Or you can browse through the Timeline, a series of 34 interactive illustrated screens about the D-Day invasion that include text and voice-overs.

Of course, what makes this such a great disk is its multimedia content. If you've never seen footage of Franklin Roosevelt, Winston Churchill, or Adolf Hitler in action, you're in for a real treat. The video clips are of very high quality, even when stretched to a full-screen view. The dramatic footage of the Normandy Beach invasion—complete with original newsreel voice-overs—really does bring the event to life on your comput-

er screen.

D-Day also includes several attractive animations to convey battle information and six intelligently illustrated maps that detail

Allied troop locations during the invasion. Each map contains several hyperlinks to other topics. In fact, just about everything is hyperlinked in D-Day; because of this, some video footage is repeated in different places. For instance, choosing "Hitler" or "Germany" from the Media Tour menu will access the same video clip.

Using D-Day Multimedia Encyclopedia is like watching a documentary film while having immediate access to a wealth of

reference materials. Though other CD-ROMs of this kind only aspire to entertain and educate, this disk does both with relative ease. It's a great way to learn about a complex subject.

—John Moore

Context Systems Inc.; 215-675-5000.

Circle 534 on reader service card

★★★★★     \$79.95



only minimal equipment damage and few casualties in order to maintain a profit margin that

allows you to continue operations. Each mission is followed by a cinematic sequence that

advances the story and introduces new characters. You can talk to these characters to learn information or bargain for a new mission.

But the heart of Strike Commander is simulation—perhaps more playable than Falcon 3.0, but definitely simula-

tion. Flying an F-16 is tricky business, and there is a steep learning curve. Still, Strike Commander is worth the effort. There's nothing like strafing a skyscraper and watching the windows get blown out! And the bubble canopy of the jet gives you such a wide field of vision that you actually get the feel of craning your neck to look for aircraft.

Strike Commander CD is quite a bargain. It's packed with hundreds of hours of gaming fun.—Bernard H. Yee



Part simulation, part graphics adventure, Strike Commander CD is all-out fun.

Abort, Retry, Fail?

THE LIGHTER SIDE OF PERSONAL COMPUTING

By Don Willmott

Newsweek quotes a Quicken fan. We're hot-keen in believing that what she really said was "hot-keying."

I'm hot-keen all over that program ... I haven't cursed at it even once.'

Wacky Want Ads

"15 year old seeks experience: Successful software & professional services company in its fifteenth year seeks outstanding individuals."

—THE PHILADELPHIA INQUIRER

"Data processing: Expr'd. OOPS, Smallpox, C++, Unix, HP, OpenView. Fax resume."—THE DALLAS MORNING NEWS

Don't They Have a Spray For Afflictions like That?

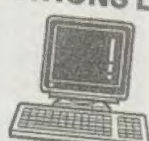
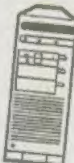
"Instead of saving in diskettes form which may get damage through fungus attack after sometime. Now, your whole software library can be stored in CD-ROM."—COMPACT DISCOUNT CLUB CATALOG

HURRY UP! HURRY UP!
LIQUIDATIONS LIQUIDATIONS LIQUIDATIONS
COMPUTERS and PERIPHERALS
COMPUTERS
KEYBOARDS
DRIVES
MONITORS
CARDS
CD ROMS
CASES

PERSIAN RUGS

MIDDLE EAST DEAL GONE AWAY

WE ARE OVERSTOCKED WITH PERSIAN RUGS & 486 COMPUTERS
DUE TO FALTERED DEAL WITH A MIDDLE EASTERN COUNTRY WE ARE NOW SERIOUSLY OVERSTOCKED WITH RUGS & COMPUTERS.

Dateline: Montana—Unsolved Mysteries from The Sheriff's Log

"A man requested a police officer respond to a local business. 'Something strange is going on with the computer in the store. The back one is talking to the front one. I locked the door and left. I would like to go back and check it out with an officer.'"—THE SILVER STATE POST (DEER LODGE, MONTANA)

Seems like Less than Seamless Copy Editing

"Created by Microsoft, the Comprehensive Thesaurus seamlessly replaces the original and boosts its synonyms by 142,000 words." —ALKI SOFTWARE BROCHURE

Here's an ad that raises far more questions than it answers. (*The Toronto Star*.)



"You know, I liked you a whole lot more on the Internet."



Of course! A monitor stand with a built-in Wite-Out holder. Now why didn't I think of that? (*Lyben Computer Systems catalog*.)

If your entry is used, we'll send you \$50 and a *PC Magazine* T-shirt. Send your entries to Abort, Retry, Fail?, *PC Magazine*, One Park Ave., New York, NY 10016-5802. Winners this issue: Dana Bell, G. Kent Cobb, Peter Commander, Neil Richler, James Schmidt, Mike Smith, and Jan Ivanoff Zimmerman.

**BETTER
FEATURES.
BETTER
PRICE.
BETTER
CHECK IT
OUT.**

**THE NEW DELL LATITUDE
8 HOUR BATTERY LIFE
ONLY \$2098**

INCLUDES \$99 OPTIONAL SECOND BATTERY.

New Dell Latitude™ 33MHz SX

\$1999

Business Lease: \$74/Mo.

- 4MB RAM
- 200MB Hard Drive
- 9.5" Dual Scan STN Color Display
- Order Code #600009



New Dell Latitude 50MHz DX2™

\$2499

Business Lease: \$93/MO.

- 4MB RAM
- 340MB Hard Drive
- 9.5" Dual Scan STN Color Display
- Order Code #600010

COMMON FEATURES

Speed & Graphics

- DX/2 and SX SL-enhanced Processors
- 32-bit Local Bus Video/1MB VRAM

Flexibility & Modularity

- 1 Type III/2 Type II PCMCIA Slots
- Removable 3.5" Floppy Replaceable with Second Battery
- 8+ Hours of Battery Life with Two Batteries (Extra battery \$99)

Ready-To-Run

- MS-DOS 6.2/Windows 3.1
- CommWorks
- America OnLine/RadioMail

DELL

To Order, Call

800-241-5868

In Canada, Call 800-668-3021

Mon-Fri 7am-9pm CT • Sat 10am-6pm CT • Sun 12pm-5pm CT

Keycode #11BNR



PC
MAGAZINE
LIBRARY

IT'S A SMALL PRICE TO PAY FOR POWER.

90MHz PENTIUM
2X CD ROM AND PCI LOCAL BUS VIDEO
ONLY \$2599

INSIDE YOU'LL FIND EVEN MORE EVERYDAY LOW PRICES.

Dell Dimension™ XPS P90
Mini Tower
A Pentium™ Based 90MHz Sys
\$2599

Business Lease*: \$109/MO.

SYSTEM SPECS:

- Mini Tower Chassis
 - 8MB RAM
 - 540MB Hard Drive
 - VS15 Monitor (15" CRT, NI)
 - PCI Video Card With 1MB VRAM
 - 2X Multi-session CD ROM Drive
 - 256KB Writeback Cache
 - One Diskette Drive (3.5")
 - SpaceSaver Keyboard
 - MS-DOS® 6.2/Microsoft® Windows™ 3.1/Mouse
- Order Code #500024

DELL SPECS: Besides everyday low prices on PCs, Dell gives you the support of a FORTUNE 500® company with nearly \$3 billion in annual sales. In fact, since our birth ten years ago, we've become one of the top five PC companies worldwide.



DELL™

To Order, Call

800-241-5862

In Canada, Call 800-668-3021

Mon-Fri 7am-9pm CT • Sat 10am-6pm CT • Sun 12pm-5pm CT

Keycode #11BNQ

